D.A.E - IoTAT Curriculum

Developed *(2023)*

(CCTE-Joint Edu. (2+1) Sino-Pak Dual Diploma program)

Entry Level: -	Matriculation (Science)
Duration of Course: -	Three Years
Credit Hours:	**70** (Annual System)
Methodology:	Theory 40%
	Practical 60%

Examination & Certification Body: Punjab Board of Technical Education

DAE in IoT APPLICATION TECHNOLOGY (IoTAT)
SCHEME OF STUDIES

FIRST YEAR			**T**	**P**	**C**
Gen	111	Islamiat & Pakistan Studies	1	0	1
Eng	112	English	2	0	2
GenC-	**112**	Chinese Language-I	2	0	2
Math	123	Applied Mathematics-I	3	0	3
Phy.	132	Applied Physics	1	3	2
Ch.	132	Applied Chemistry	1	3	2
OHSE	111	Occupational Health, Safety & environment	1	0	1
CIT	112	Computer Application Software	0	6	2
CIT	113	Introduction to Computer Programming	2	3	3
IoT	112	Python Programming	1	3	2
CIT	121	General Engineering Workshop	0	3	1
CIT	134	Electronics-I	3	3	4
		T o t a l	**17**	**24**	**25**
SECOND YEAR					
Gen	211	Islamiat & Pak Studies	1	0	1
GenC-	**212**	Chinese Language-II	2	0	2
MgmC-	**212**	Understanding China	2	0	2
Math	233	Applied Mathematics-II	3	0	3
Mgm	211	Business Communication	1	0	1
CIT	**212**	Object-Oriented Programming with JAVA	1	3	2
CIT	**223**	Computer Networks	2	3	3
CIT	**235**	Micro-Processor Architecture	3	6	5
CIT	233	Operating System	1	3	2
IOT	212	SCM Application Technology	1	3	2
CIT	244	Electronics-II	3	3	4
CIT	263	Relational Data-Base Management System	2	3	3
IOT	221	Introduction to IoT Engineering	1	0	1
		T o t a l	**23**	**24**	**31**
THIRD YEAR					
Gen	311	Islamiat & Pak Studies	1	0	1
CIT	303	Web Development with JAVA	1	3	2
IOT	312	Wireless Transmission Technology	1	3	2
IOT	322	Identification Technology of IoT	1	3	2
IOT	332	Embedded Technology of IoT	1	3	2
IOT	342	Application Development of IoT	1	3	2
IOT	351	Practical Project of IoT	0	3	1
IOT	363	Post Practice	0	9	3
		T o t a l	**6**	**27**	**15**

اسلامیات/مطالعہ پاکستان

		ٹی	پی	سی
حصہ اول اسلامیات	GEN III			
حصہ دوم مطالعہ پاکستان		1	0	1
موضوعات حصہ اول اسلامیات	سال اول	کل وقت: 20 گھنٹے		

کتاب و سنت

(ا) قرآن مجید

-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 تنالو البر حتی تنفقوا مما تحبون

1.2 واعتصموا بحبل اللّٰہ جمیعا" ولا تفرقو

1.3 ولا یجرمنکم شنان قوم علی ان لا تعدلوا

1.4 ان اللّٰہ یامرکم ان تودوا الامانات الی اھلھا

1.5 ان اللّٰہ یامر بالعدل والاحسان

1.6 ان الصلوتہ تنھی عن الفحشاء والمنکر

1.7 لقد کان لکم فی رسول اللّٰہ سوۃ حسنتہ

1.8 ان اکرمکم عند اللّٰہ اتقاکم

1.9 وما آتاکم الرسول فخرزوو ومانھی عنھوانتھوا

1.10 ولوفو بالعھد

1.11 وماشروھن بالمعروف

1.12 یمحق اللّٰہ الربوویر بی الصمدقات

1.13 واصبر علی ما اصابک

1.14 وقولو قولا سدیدا

1.15 ان الدین عند اللّٰہ السلام

(ب) سنت

-1 سنت کی اہمیت

-2 دس منتخب احادیث مع ترجمہ و تشریح

1- انما الاعمال بالنیات

2- انما بعثت لاتمم مکارم الاخلاق

3- لا یومن احدکم حتی یحب لاخیہ ما یحب لنفسہ

4- المسلم من سلم المسلمون من لسانہ ویدہ

5- قل امنت باللہ ثم استقم

6- خیرکم خیرکم لاہلہ

7- سباب المسلم فسوق وقتالہ کفر

8- المومن اخو المومن

9- کل المسلم علی المسلم حرام بمعہ وما لہ وعرضہ

10- ایتہ المنافق ثلاث اذا حدیث کذب واذا اوتمن خان واذا وعد اخلف

دین اسلام

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

1- توحید

2- رسالت

3- آخرت

4- ملائکہ

5- آسمانی کتب

2.2 عبادات

1- نماز 2- روزہ 3- حج 4- زکوٰۃ

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

حصہ اول

حصہ اسلامیت

تدریسی مقاصد

1- قرآن مجید

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

خصوصی مقاصد: طالب علم اس قابل ہو جائے گا کہ

- ☆ قرآن مجید کی تعریف کر سکے گا
- ☆ قرآن مجید کے نزول کی صورت بیان کر سکے
- ☆ قرآن مجید کی کی دس مدنی سورتوں کی پہچان کر سکے
- ☆ منتخب آیات کا ترجمہ و تشریح کر سکے

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

- ☆ قرآنی آیات کا ترجمہ تشریح کر سکے
- ☆ قرآنی تعلیمات کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

2- سنت

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

خصوصی مقصد:

- ☆ سنت کی تعریف بیان کر سکے
- ☆ سنت کی اہمیت و ضرورت کی وضاحت کر سکے
- ☆ سنت کی روشنی میں اسوہ حسنہ پر عمل کر سکے

3- منتخب احادیث نبویہ

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

خصوصی مقصد: احادیث کا ترجمہ و تشریح کر سکے

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

-4 دین اسلام

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

خصوصی مقاصد

لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے

اسلام کے بنیادی مقاصد کی اہمیت بیان کر سکے

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

عبادت کے لغظی و اصطلاحی معنی بیان کر سکے

عقیدے اور عبادت کا فرق بیان کر سکے

عبادات (نماز، روزہ، حج، زکواۃ) کے فوری اثرات اور انسانی زندگی پر ان کی اثرات بیان کر سکے

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

(غیر مسلم طلباء کے لئے)

ک	ع	ی
1	0	1

نصاب اخلاقیات سال اول — GEN 101

حصہ دوم مطالعہ پاکستان

کل وقت - 20 گھنٹے

موضوعات

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون، عقل، الہی کتب)

مندرجہ ذیل اخلاق کی وضاحت

- ☆ دیانت داری
- ☆ وفاداری
- ☆ نظم و ضبط
- ☆ راست گوئی
- ☆ صبر و استقلال
- ☆ حوصلہ مندی
- ☆ وقت کی پابندی
- ☆ صفائی
- ☆ اتحاد
- ☆ باہمی احترام
- ☆ مصلحت

نصاب اخلاقیات (سال اول)

تدریسی مقاصد

عمومی مقاصد: اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں مثبت قدر اضافہ کر سکے

خصوصی مقاصد: طالب اس علم سے اس قابل ہو گا کہ

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

نصاب (سال اول) Gen III

حصہ دوم　　مطالعہ پاکستان　　کل وقت 12 گھنٹے

موضوعات

☆ حریت فکر: مسلمان قوم میں آزادی فکر کی تاریخ - مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت - ذہنی، جسمانی غلامی کے متعلقات

☆ نظریہ پاکستان

قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض و غایت نظریہ پاکستان کی وضاحت - نظریہ پاکستان اور مسلم اقبال اور قائداعظم کے ارشادات کی روشنی میں

☆ نظریہ پاکستان کا تاریخی پس منظر

محمد بن قاسم کی آمد - مجدد الف ثانی اور شاہ ولی اللہ کی تبلیغی خدمات سید احمد شہید کی تحریک مجاہدین

☆ تعلیمی تحریکیں

علی گڑھ - ندوۃ العلماء (لکھنؤ) - مدرسۃ الاسلام - (کراچی) اسلامیہ کالج (پشاور) انجمن حمایت اسلام (لاہور)

مطالعہ پاکستان (حصہ دوئم)

تدریسی مقاصد

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 اظہار رائے کی اہمیت بیان کر سکے
- ☆ ذہنی غلامی کے قومی سطح پر نقصانات کے بیان کر سکے
- ☆ جسمانی غلامی قومی سطح پر نقصانات بیان کر سکے

نظریہ پاکستان

عمومی مقصد:

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

خصوصی مقاصد:

- ☆ نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے
- ☆ نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے
- ☆ علامہ اقبال اور قائداعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد

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

خصوصی مقاصد:

- ☆ محمد بن قاسم کے بارے میں بیان کر سکے

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

علمی تحریکیں

عمومی مقصد

- برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد:

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

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Eng-112 ENGLISH

Total contact hours

		T	P	C
Theory	64			
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 hours

1.1 First eight essays of Intermediate English Book-II

2 CLOZE TEST 4 hours

2.1 A passage comprising 50-100 words will be selected from the text. Every 11th 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 hours

3.1 Sentence Structure.
3.2 Tenses.
3.3 Parts of speech.
3.4 Punctuation.
3.5 Change of Narration.
3.6 One word for several
3.7 Words often confused

4. COMPOSITION 8 hours

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.

5. TRANSLATION 10 hours

5.1 Translation from Urdu into English.
For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

1. Intermediate English Book-II.
2. An English Grammar and Composition of Intermediate Level.
3. A Hand Book of English Students By Gatherer.

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. APPLY 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.

GenC-112 Chinese Language- I

Total contact hours

Theory	64	T	P	C
Practical	0	2	0	2

PART ONE

AIMS This course consists of 18 classes (including mid-term test and final test). After completing this part, students can master the primary Chinese language knowledge taught in the content of the course, and be able to achieve and exceed the **HSK level One**.

INSTRUCTION OBJECTIVE The course is mainly for zero-based learners. Through the study of this course, learners can lay a solid language foundation and have a preliminary understanding of Chinese language structure, including Pinyin, Chinese characters, words, grammar and other knowledge. After completing this course, learners can understand and use some basic words and sentences, and complete the most basic communication, such as greeting, asking, introducing, shopping and so on.

COURSE CONTENTS

1. **Lesson 1 Hello Vs Nǐhǎo 1 hour**

This lesson briefly introduces pinyin and spelling methods.

2. **Hello! 1 hour**

This lesson briefly introduces the sentence patterns used in greeting, such as dialogue, greeting farewell, and introducing one's own name.

3. **Lesson 3 I am Britain 2 hour**

Teach students to understand basic classroom language, learn to use "national + person" for simple communication dialogue, and introduce which country they come from.

4. **Lesson 4 What's the date today 2 hour**

This lesson introduces the expression of numbers, years, months, etc., and teaches students to ask about a date and answer it.

5. **Lesson 5 This is my brother 2 hours**

By introducing family members, students can understand the simple words when asking about family status and introduce them briefly.

6. **Lesson 6 I'm nineteen years old 2 hours**

This lesson expands quantifiers and animal names, and introduces the expression of age, so that students can ask and answer each other's age correctly.

7. **Lesson 7 What time is it 2 hours**

This lesson introduces the usage of hours, minutes and seconds, so that students can describe their lives with time points.

8. **Lesson 8 What do you like to do on weekends 2 hours**

This lesson introduces the expressions of hobbies, interests, activities and other related nouns, so as to help students communicate with each other by using simple linking sentences.

Semi-MID-TERM REVIEW 2 hours

Mid-term review is a summary of the knowledge learned in the past. The test paper uses the knowledge points learned in the past to design listening questions, answering questions by looking at pictures, connecting questions, filling in blanks, etc., which are illustrated with pictures and interesting, and can test students' learning effect.

9. Lesson 9 Introduce yourself 2 hours

Explain the related expressions related to self-introduction, and students can correctly introduce their names, families, ages, hobbies, school majors, etc. 2

10. Lesson 10 My father is in Beijing 2 hours

This lesson introduces the names of major cities in China, Britain and Europe, and introduces the use of "person + place" in sentences.

11. Lesson 11 I came to Beijing by plane 2 hours

This lesson introduces the means of transportation and how to express long sentences in combination with the time and place learned before.

12. Lesson 12 I eat at the company 2 hours 2 hours

This lesson introduces the polite expressions used in eating.

13. Lesson 13 The weather is fine on Monday 2 hours

It shows the conversations and topics that may appear when you want to date.

14. Lesson 14 How much is it altogether 2 hours

This lesson introduces the vocabulary and sentences commonly used in shopping, and how to use Chinese for daily shopping.

15. Lesson 15 What would you like to have 2 hours

This lesson introduces the classic Chinese and Thai cuisine, the terms of treating guests, and the communicative terms of how to order food in restaurants.

16. Lesson 16 The bathroom is next to the pantry 2 hours

This lesson introduces location and location words, and how to use location words to introduce the location of a place.

Semi- FINAL REVIEW 2 hours

Similar to the mid-term test questions, it is a test of important knowledge points of the course to test students' learning effect. This lesson briefly introduces pinyin and spelling methods.

PART- TWO

AIMS After completing this part, students can master the basic Chinese language knowledge taught in the content of the course, and be able to reach and exceed **HSK level TWO.**

INSTRUCTION OBJECTIVE Learners can master the language knowledge and use some basic grammar and sentence patterns in communication, learn to express personal feelings and attitudes in Chinese, and can complete communicative functions such as gratitude, apology, introduction and farewell, and begin to understand Chinese cultural knowledge and cultivate interest in learning.

COURSE CONTENTS

1. **Lesson 1 I was still sleeping at 7 o'clock 1 hour**

This lesson introduces the grammatical points of "still", so that students can correctly understand the meaning of sentences related to "still" and use this sentence pattern correctly for communication.

2. **Lesson 2 It will be cloudy tomorrow 1 hour**

By introducing the weather in several Chinese cities, explain how to use temperature to answer weather questions.

3. **Lesson 3 That one is five hundred dollars cheaper than this one 1 hour**

This lesson explains comparative sentences, and compares them in terms of price, height and temperature, so that students can understand comparative sentences thoroughly.

4. **Lesson 4 This is a family photo 1 hour**

This lesson introduces family members in detail through appearance, clothing and occupation, so that students can master more detailed description methods.

5. **Lesson 5 It is forbidden to take pictures here 2 hours**

This lesson leads students to understand the relevant knowledge points of expressing commands, such as forbidden and forbidden, so that students can correctly understand the meaning of words in daily life.

6. **Lesson 6 I can't find something 2 hours**

This lesson introduces the use of language points in "V + should + result complement", so that students can correctly use relevant sentence patterns in communication.

7. **Lesson 7 I have been to Sichuan and seen pandas 2 hours**

This lesson introduces Chinese culture through "V + have been to", such as the Great Wall, the Forbidden City, national treasures, etc., so that students can use this sentence pattern correctly in communication.

8. **Lesson 8 I hope you can come to my wedding 2 hours**

By introducing Chinese weddings, this lesson enables students to master the verbal usage of banquet invitation, holiday blessing, emotional expression and euphemistic refusal.

Semi-MID-TERM REVIEW 2 hours

This section leads students to review the knowledge points they have learned in the past and conduct mid-term tests through reading pictures, listening questions and connecting questions to test students' learning effect.

9. **Lesson 9 Be ill, take more rest 2 hours**

This lesson introduces the vocabulary related to illness and the doctor's medication advice, so that students can correctly describe and understand the doctor's meaning in the process of seeing a doctor.

10. **Lesson 10 The station is just across the road 2 hours**

This lesson introduces the way of asking places and answers by asking directions, which helps students to use relevant sentence patterns for practical communication questions and answers.

11.Lesson 11 She sings very well 2 hours

This lesson focuses on hobbies and introduces the correct use of related words in sentences.

12.Lesson 12 Did you do well in the exam 2 hours

By describing the examination process and the situation of answering questions, students can correctly understand the instructions of the examination room, the distribution of questions and the analysis of test paper problems

13.Lesson 13 Buy two and get one free 2 hours

This lesson introduces the commodity names of supermarkets, as well as common terms such as promotional activities, discounts and price reductions.

14.Lesson 14 We're a new restaurant 2 hours

This lesson helps students understand how to understand the waiter's recommendation and put forward the food requirements for ordering.

15.Lesson 15 The girl is dressed in white clothes 2 hours

This lesson introduces others' clothes and how to use grammar points to describe the state of something through "V + be dressed in".

16.Lesson 16 You can be discharged from hospital next week 2 hours

This lesson introduces a variety of expressions, such as hospitalization, visiting patients and discharge, so that students can understand the language of hospital scenes and strengthen their multi-scene communication ability.

Semi- FINAL REVIEW

2 hours

This section is similar to the mid-term review, which leads students to review the knowledge points they have learned in the past and conduct final tests by looking at pictures, listening questions, connecting questions, etc., to test students' learning effect.

Recommended Book

Tang Chinese Course 1 for PART TWO
Tang Chinese Course 2 for PART TWO

Math-123 APPLIED MATHEMATICS-I

T	P	C
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, Mensuration, 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

1. QUADRATIC EQUATIONS **6 Hours**

1.1 Standard Form
1.2 Solution
1.3 Nature of roots
1.4 Sum & Product of roots
1.5 Formation
1.6 Problems

2. BINOMIAL THEOREM **6 Hours**

2.1 Factorials
2.2 Binomial Expression
2.3 Binomial Co-efficient
2.4 Statement
2.5 The General Term
2.6 The Binomial Series
2.7 Problems.

3. PARTIAL FRACTIONS **6 Hours**

3.1 Introduction
3.2 Linear Distinct Factors Case I
3.3 Linear Repeated Factors Case II
3.4 Quadratic Distinct Factors Case III
3.5 Quadratic Repeated Factors Case IV
3.6 Problems

4. FUNDAMENTALS OF TRIGONOMETRY **6 Hours**

4.1 Angles
4.2 Quadrants
4.3 Measurements of Angles
4.4 Relation between Sexagesimal & circular system
4.5 Relation between Length of a Circular Arc & the Radian Measure of its central Angle
4.6 Problems

5. TRIGONOMETRIC FUNCTIONS AND RATIOS **6 Hours**

5.1 Trigonometric functions of any angle
5.2 Signs of trigonometric Functions
5.3 Trigonometric Ratios of particular Angles
5.4 Fundamental Identities
5.5 Problems

6. GENERAL IDENTITIES **6 Hours**

6.1 The Fundamental Law
6.2 Deductions
6.3 Sum & Difference Formulae
6.4 Double Angle Identities
6.5 Half Angle Identities
6.6 Conversion of sum or difference to products
6.7 Problems

7. SOLUTION OF TRIANGLES **6 Hours**

7.1 The law of Sines
7.2 The law of Cosines
7.3 Measurement of Heights & Distances
7.4 Problems

8. VECTORS AND PHASORS **12 Hours**

8.1 Scalars and Vectors
8.2 The unit Vectors i, j, k
8.3 Direction Cosines
8.4 Dot Product
8.5 Cross Product
8.6 Analytic Expressions for dot and cross products
8.7 Phasors
8.8 Significance of j Operator
8.9 Different Forms
8.10 Algebraic Operations
8.11 Problems

9. COMPLEX NUMBERS **9 Hours**

9.1 Introduction and Properties
9.2 Basic Operations
9.3 Conjugate
9.4 Modulus
9.5 Different Forms
9.6 Problems

10. BOOLEAN ALGEBRA AND GATE NETWORKS **15 Hours**

10.1 Concept and basic laws
10.2 Sums of product and products of sums
10.3 Binary, decimals and octal, presentation of decimal numbers in BCD
10.4 Interconversion of numbers
10.5 OR Gates and AND Gates

10.6 Logical Expressions and their simplifications
10.7 Demorgan's Theorams
10.8 NAND Gates and NOR Gates
10.9 Problems

11. PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE 6 Hours

11.1 Coordinate system
11.2 Distance formula
11.3 Ration Formulas
11.4 Inclination and slope of line
11.5 Slope Formula
11.6 Problems

12. EQUATIONS OF THE STRAIGHT LINE 6 Hours

12.1 Some Important Forms
12.2 General form
12.3 Angle Formula
12.4 Parallelism and Perpendicularity
12.5 Problems

13. EQUATIONS OF THE CIRCLE 6 Hours

13.1 Standard and Central forms of equations
13.2 General Form of Equation
13.3 Radius and Coordinates of Center
13.4 Problems

RECOMMENDED BOOKS

Applied Mathematics: Math-123, Developed by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Evaluated by Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

Math-123 APPLIED MATHEMATICS-I

INSTRUCTIONAL OBJECTIVES

1. USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATION

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 the sum and product of the roots.
1.7 Form a quadratic equation from the given roots.
1.8 Solve problems involving quadratic equations.

2. APPLY BINOMIAL THEOREM FOR THE EXPANSION OF BINOMIAL AND EXTRACTION OF ROOTS.

2.1 State binomial theorem for positive integral index.
2.2 Explain binomial coefficients:
(n,0), (n,1).....(n,r)....., (n,n)
2.3 Derive expression for the general term.
2.4 Calculate the specified terms.
2.5 Expand a binomial of a given index.
2.6 Extract the specified roots.
2.7 Compute the approximate value to a given decimal place.
2.8 Solve problems involving binomials.

3. APPLY DIFFERENT METHODS FOR RESOLVING A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS

3.1 Define a partial fraction, a proper and an improper Fraction.
3.2 Explain all the four types of partial fractions.
3.3 Set up equivalent partial fractions for each type.
3.4 Explain the methods for finding constants involved.
3.5 Resolve a single fraction into partial fractions.
3.6 Solve problems involving all the four types.

4. UNDERSTAND THE SYSTEMS OF MEASUREMENT OF ANGLES.

4.1 Define angles and the related terms.
4.2 Illustrate the generation of an angle.
4.3 Explain sexagesimal and circular systems for the measurement of angles.
4.4 Derive the relationship between radian and degree.
4.5 Convert radians to degrees and vice versa.
4.6 Derive a formula for the circular measure of a central angle.
4.7 Use this formula for solving problems.

5. UNDERSTAND BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRIC FUNCTIONS.

5.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.

5.2 Derive fundamental identities.
5.3 Find trigonometric ratios of particular angles.
5.4 Draw the graph of trigonometric functions.
5.5 Solve problems involving trigonometric functions.

6. USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICAL PROBLEMS.

6.1 List fundamental identities.
6.2 Prove the fundamental law.
6.3 Deduce important results.
6.4 Derive sum and difference formulas.
6.5 Establish half angle, double and triple angle formulas.
6.6 Convert sum or difference into product and vice versa.
6.7 Solve problems.

7. USE CONCEPT, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES.

7.1 Define angle of elevation and angle of depression.
7.2 Prove the law of sines and the law of cosines.
7.3 Explain elements of a triangle.
7.4 Solve triangles and the problems involving heights and distances.

8. UNDERSTAND PRINCIPLES OF VECTORS AND PHASORS

8.1 Define unit vectors i, j, k.
8.2 Express a vector in the component form.
8.3 Explain magnitude, unit vector, direction cosines of a vector.
8.4 Explain dot product and cross product of two vector.
8.5 Deduce important results from dot and cross product.
8.6 Define phasor and operator j.
8.7 Explain different forms of phasors.
8.8 Perform basic Algebraic operation on phasors.
8.9 Solve problems on phasors.

9. USE PRINCIPLES OF COMPLEX NUMBERS IN SOLVING TECHNOLOGICAL PROBLEMS.

9.1 Define a complex number and its conjugate.
9.2 State properties of complex numbers.
9.3 Give different forms of complex numbers.
9.4 Perform basic algebraic operations on complex numbers.
9.5 Solve problem involving complex numbers.

10. SOLVE TECHNICAL PROBLEMS USING PRINCIPLES OF BOOLEAN ALGEBRA

10.1 Explain fundamental concepts of Boolean algebra
10.2 Explain binary numbers, octal numbers, decimal numbers and their interconversion.
10.3 Explain digital addition and multiplication and its applications to OR gates and AND Gates
10.4 Illustrate complementation and inversion
10.5 Evaluate logical expression
10.6 List basic Laws of Boolean Algebra

10.7 Explain De-Morgan's theorem
10.8 Explain basic duality of Boolean algebra
10.9 Derive Boolean expression
10.10 Explain combination of GATES
10.11 Illustrate sum of products and product of sum
10.12 Derive product of sum expression
10.13 Explain NAND Gates and NOR Gates
10.14 Use the map methods for simplifying expressions
10.15 Explain sub-cubes and covering

11. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY

11.1 Explain the rectangular coordinate system.
11.2 Locate points in different quadrants.
11.3 Derive distance formula.
11.4 Describe the ratio formula
11.5 Derive slope formula
11.6 Solve problems using the above formulae.

12. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.

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

13. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE

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

Phy-132: Applied Physics

Total Contact Hours:

Theory: 32
Practical: 96

T	P	C
1	3	2

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 course.

Course contents	**Hours**
1. Measurements	**02**
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	
2. Scalars and Vectors	**04**
2.1. Revision of head to tail rule	
2.2. Laws of parallelogram, triangle and polygon of forces	
2.3. Resolution of a vectors by rectangular components	
2.4. Multiplication of two vectors, dot product and cross product	
3. Motion	**04**
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	
4. Torque, Equilibrium and rotational inertia	**04**
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. Sound	**06**
5.1. Longitudinal waves	
5.2. Intensity, loudness, pitch and quality of sound	
5.3. Units of intensity of level and frequency response of ear	
5.4. Interference of sound waves silence zones, beats	
5.5. Acoustics	
5.6. Doppler effect	
6. Light	**06**
6.1. Review laws of reflection and refraction	

6.2. Image formation by mirrors and lenses
6.3. Optical instruments
6.4. Waves theory of light
6.5. Interference, diffraction, polarization of light waves
6.6. Applications of polarization in sunglasses, optical activity and stress analysis

7. Optical Fiber **02**

7.1. Optical communication and problems
7.2. Review total internal reflection and critical angle
7.3. Structure of optical fiber
7.4. Fiber material and manufacture
7.5. Optical fiber – uses

8. Lasers **03**

8.1. Corpuscular theory of light
8.2. Emission and absorption of light
8.3. Stimulated absorption and emission of light
8.4. Laser principles
8.5. Structure and working of lasers
8.6. Types of lasers with brief description
8.7. Applications (Basic concepts)
8.8. Material processing
8.9. Laser welding
8.10. Laser assisted machining
8.11. Micro machining
8.12. Drilling, scribing and marking
8.13. Printing
8.14. Lasers in medicine

9. Electromagnetic waves **03**

9.1. Magnetic field around a current carrying conductor
9.2. Electric field induced around an changing magnetic flux
9.3. Moving fields
9.4. Types of electromagnetic waves
9.5. Generation of Radio waves
9.6. Spectrum of electromagnetic waves

10. Artificial Satellites **02**

10.1. Review law of gravitation
10.2. Escape velocity
10.3. Orbital velocity
10.4. Geosynchronous and geostationary satellites
10.5. Use of satellites in data communication

Recommended Books:

Text Book Developed by TEVTA for Phy-132

Phy-132 Instructional Objectives: Applied Physics

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 problem.
   3.2 Explain relation between liner 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. **Understand concepts of sound**
   5.1 Describe longitudinal wave and its propagation.
   5.2 Explain the concepts: Intensity, loudness, pitch and quality of sound.
   5.3 Explain units of intensity of level and frequency response of ear.
   5.4 Explain phenomena of silence zones, beats.
   5.5 Explain acoustics of buildings.
   5.6 Explain Doppler's Effect giving mathematical expressions.
6. **Use the concepts of geometrical optics to mirrors and lenses**
   6.1 Explain laws of reflection and refraction.
   6.2 Use mirror formula to solve problems.
   6.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscope, telescopes, camera and sextant.
7. **Understand wave theory of light**
   7.1 Explain wave theory of light.
   7.2 Explain phenomena of interference, diffraction, polarization of light waves.
   7.3 Describe uses of polarization given in the course contents.
8. **Understand the structure, working and uses of optical fiber**
   8.1 Explain the structure of the optical fiber.
   8.2 Explain its principles of working.
   8.3 Describe use of optical fiber in industry and medicine.
9. **Understand the structure, working and uses of lasers**

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

10. Understand nature, types, generation and spectrum of electromagnetic waves

10.1 Explain magnetic field due to current and electric field due to changing magnetic flux.
10.2 Explain moving fields.
10.3 Describe types of electromagnetic waves.
10.4 Explain generation of radio waves
10.5 Explain spectrum of electromagnetic waves.

11. Understand types and uses of artificial satellites

11.1 Explain escape velocity.
11.2 Explain orbital velocity.
11.3 Distinguish between geosynchronous and geostationary satellites.
11.4 Describe uses of artificial satellites in data communication.

Phy-132 List of Practical: Applied Physics 96 Hrs.

1. Draw graphs representing the functions:
   1.1. Y=mx for m=0, 0.5, 1,2
   1.2. $Y=x^2$
   1.3. Y=1/x
2. Find the volume of a given solid cylinder using Vernier calipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Proven that force is directly proportional to (a) mass, (b) acceleration, using Fletcher's 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:
   7.1. Law of parallelogram of forces.
   7.2. Law of triangle of forces.
   7.3. Lami's theorem.
8. Verify law op 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 plan mirror.
29. Find focal length of converging lens by displacement method.
30. Find focal length of diverging lenses 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 leas 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.

Ch-132 APPLIED CHEMISTRY

Total Contact Hours		T	P	C
Theory	32	1	3	2
Practical	96			

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. Becomes acquainted with the basic principles of chemistry as applied in the study of relevant Technology.
3. Knows the scientific methods for production, properties and use of materials of industrial & technological significance.
4. Gain skill for the efficient conduct of practicals in a chemistry lab.

1. INTRODUCTION **2 Hours**

1.1 The scope and significance of the subject.
1.2 Orientation with reference to Technology.
1.3 Terms used & units of measurements in the study of chemistry.

2. FUNDAMENTAL CONCEPTS OF CHEMISTRY **2 Hours**

2.1 Symbols, Valency, Radicals, formulas.
2.2 Chemical Reactions & their types.
2.3 Balancing of equations by ionic method.

3. ATOMIC STRUCTURE **2 Hours**

3.1 Sub-atomic particles.
3.2 Bohr's Atomic Model.
3.3 The periodic classification of elements and periodic law
3.4 General characteristics of a period and group.

4. CHEMICAL BOND **2 Hours**

4.1 Nature of chemical Bond.
4.2 Electrovalent bond with examples.
4.3 Covalent Bond(Polar and Non-polar, sigma & Pi Bonds with examples.
4.4 Co-ordinate Bond with examples.

5. SOLIDS AND LIQUIDS **3 Hours**

5.1 The liquid and Solids state.
5.2 The liquids and their general properties (Density, viscosity, surface tension capillary action etc.)
5.3 Solids and their general properties.
5.4 Crystal structure of solids
5.5 Crystals of Si and Ge.

6. WATER **3 Hours**

6.1 Chemical nature and properties.
6.2 Impurities.
6.3 Hardness of water (types, causes & removal)
6.4 Scales of measuring hardness (Degress Clark, French, PPM, Mgm per litre).
6.5 Boiler feed water, scales and treatment.
6.6 Sea-water desalination, sewage treatment.

7. ACIDS, BASES AND SALTS **2 Hours**

7.1 Definitions with examples.
7.2 Properties, their strength, basicity & Acidity.
7.3 Salts and their classification with examples.
7.4 pH-value and scale.

8. OXIDATION & REDUCTION **2 Hours**

8.1 The process with examples.
8.2 Oxidizing and Reducing agents.
8.3 Oxides and their classifications.

9. NUCLEAR CHEMISTRY **2 Hours**

9.1 Introduction.
9.2 Radioactivity (Alpha, beta and gamma rays).
9.3 Half life process.
9.4 Nuclear reaction & transformation of elements.
9.5 Isotopes and their uses.

10. ALLOYS **2 Hours**

10.1 Introduction with need.
10.2 Preparation and properties.
10.3 Some important alloys and their composition.

11. CORROSION **2 Hours**

11.1 Introduction with causes.
11.2 Types of corrosion.
11.3 Rusting of Iron
11.4 Protective measures against corrosion.

12. ELECTRO CHEMISTRY **2 Hours**

12.1 Ionization and Arrhenius theory of Ionization.
12.2 Electrolytes and Electrolysis.
12.3 Faraday's Laws and numericals related to them.
12.4 Application of Electrolysis (Electron, lathing etc).
12.5 Electro Chemical cells.

13. ELECTRICAL INSULATING MATERIALS. **2 Hours**

13.1 Introduction.
13.2 Solid insulators with chemical nature.

13.3 Liquid insulators with chemical nature.
13.4 Gaseous insulators with chemical nature.
13.5 Uses and their classification.

14. SEMI CONDUCTORS. 2 Hours

14.1 Introduction
14.2 Atomic structure of silicon and germanium.
14.3 Bonding & Conductivity.
14.4 Energy bands in a semiconductor.

15. ETCHING PROCESS. 2 Hours

15.1 The process and its aims.
15.2 Etching reagents.
15.3 Applications of processors.

RECOMMENDED BOOKS

1.Text Book Developed by TEVTA

Ch-132 APPLIED CHEMISTRY

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE SCOPE, SIGNIFICANCE AND ROLE OF THE SUBJECT.

1.1 Define chemistry and its terms.
1.2 Define the units of measurements in the study of chemistry.
1.3 Explain the importance of chemistry in various fields of specialization.
1.4 Explain the role of chemistry in this technology.

2. UNDERSTAND LANGUAGE OF CHEMISTRY AND CHEMICAL REACTIONS.

2.1 Define symbol, valencey, radical, formula with examples of each.
2.2 Write chemical formula of common compounds.
2.3 Define chemical reaction and equations.
2.4 Describe types of chemical reactions with examples.
2.5 Explain the method of balancing the equation by ionic method.

3. UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS.

3.1 Define atom.
3.2 Describe the fundamental sub atomic particles
3.3 Distinguish between atomic no. mass no. and between isotope and isobars.
3.4 Explain the arrangements of electrons in different shells and sub energy levels and understand bohr's atomic model.
3.5 Explain the grouping and placing of elements in the periodic table especially Si & germanium.
3.6 State the periodic law of elements.
3.7 Explain the trend of properties of elements based on their position in the periodic table.
3.8 Explain general characteristics of a period and a group.

4. UNDERSTAND THE NATURE OF CHEMICAL BONDS.

4.1 Define chemical Bond.
4.2 State the nature of chemical bond.
4.3 Differentiate between electrovalent and covalent bonding.
4.4 Explain the formation of polar and non polar, sigma and pi-bond with examples.
4.5 Describe the nature of coordinate bond with examples.

5. UNDERSTAND THE STATES OF MATTER AND DISTINGUISHES SOLIDS FROM GASES.

5.1 Describe the liquid and solid states of matter.
5.2 State the general properties of liquid.
5.3 State the general properties of solid.
5.4 Explain the formation of crystals and their types.
5.5 Describe the crystal structure of Si and Ge.

6. UNDERSTAND THE CHEMICAL NATURE OF WATER.

6.1 Describe the chemical nature of water with its formula.
6.2 Describe the general impurities present in water.

6.3 Explain the causes and methods to remove hardness of water.
6.4 Express hardness in different units like mg/litre. p.p.m, degrees Clark and degrees French.
6.5 Describe the formation and nature of scales in boiler feed water.
6.6 Explain the method for the treatment of scales.
6.7 Explain the sewage treatment and desalination of sea water.

7. UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS.

7.1 Define acids, bases and salts with examples.
7.2 State general properties of acids and bases.
7.3 Differentiate between acidity and basicity.
7.4 Define salts, give their classification with examples.
7.5 Explain pH value of solution and pH scale.

8. UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION.

8.1 Define oxidation.
8.2 Illustrate the oxidation process with examples.
8.3 Define reduction.
8.4 Explain reduction process with examples.
8.5 Define oxidizing and reducing agents and give at least six examples of each.
8.6 Define oxides.
8.7 Classify the oxides and give examples.

9. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.

9.1 Define nuclear chemistry and radio activity.
9.2 Differentiate between alpha, beta and gamma particles.
9.3 Explain half life process.
9.4 Explain at least six nuclear reactions resulting in the transformation of some elements.
9.5 State the uses of isotopes.

10. UNDERSTAND THE NATURE OF ALLOYS USED IN THE RESPECTIVE TECHNOLOGY.

10.1 Define alloy.
10.2 Explain different methods for the preparation of alloys.
10.3 Explain important properties of alloys.
10.4 Explain the composition, properties and uses of alloys.

11. UNDERSTAND THE PROCESS OF CORROSION.

11.1 Define corrosion.
11.2 Describe different types of corrosion.
11.3 State the causes of corrosion.
11.4 Explain the process of rusting of iron.
11.5 Describe methods to prevent/control corrosion.

12. UNDERSTAND THE APPLICATION OF ELECTROCHEMISTRY IN DIFFERENT FIELDS OF INDUSTRIES.

12.1 Define ionization, electrolyte and electrolysis.
12.2 Describe Arrhenius theory of ionization.

12.3 State Faraday's laws of electrolysis.
12.4 Apply Faraday's laws of different fields of industry.
12.5 Solves numerical problem on Faraday's Laws.
12.6 Explain the construction and working of Daniel cell and lead accumulator.

13. KNOW THE USE OF INSULATING MATERIALS.

13.1 Define insulator, conductor.
13.2 Classify solid, liquid and gaseous insulators with their chemical nature.
13.3 Describe their uses.

14. UNDERSTAND THE NATURE AND CHEMISTRY OF SEMI CONDUCTORS.

14.1 Define semi -conductors.
14.2 Draw the atomic structure of silicon and germanium.
14.3 Describe the process of bonding and conductivity in conductors and semi-conductors.
14.4 Explain energy bands in semi- conductors.

15. USE ETCHING PROCESS IN DIFFERENT FIELDS OF TECHNOLOGY.

15.1 Define etching process and its aims.
15.2 Enlist the chemicals/reagents used in the process.
15.3 Explain the use of the process in the technology.

Course Code: **OHSE 111**	**T**	**P**	**C**
Course Title: **Occupational Health, Safety and Environment**	**1**	**0**	**1**

An introductory course on work-related health and safety issues. It aims to provide students with right attitude toward safety in work places. It covers the topics on different possible causes of safety hazards. It is pure theory course.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the issues affecting occupational health and safety.
- Apply concepts of environmental protection
- Practice safety measures in laboratory and workplaces
- Integrate health and safety consciousness in daily life

COURSE OUTLINE

Contents	**Hours**

COURSE CONTENTS

1. Identification and control of Hazards (10 Hours)

- 1.1 Methods of identify hazards with in the work place.
  - 1.1.1 Statements
  - 1.1.2 Analysis of significant risks
  - 1.1.3 Prediction of results or outcomes of those risks
  - 1.1.4 Use of accident data
  - 1.1.5 Careful consideration of work methods
- 1.2 Consideration of the workplace and its potential for harm.
  - 1.2.1 Confined spaces
  - 1.2.2 Working at heights
  - 1.2.3 Electrical hazards
  - 1.2.4 Chemicals
  - 1.2.5 Noise
- 1.3 Hazards which become risks:
  - 1.3.1 Identification of minor or major risk
  - 1.3.2 Potential to cause harm
  - 1.3.3 Choosing appropriate control measures
  - 1.3.4 Electrical safety
    - 1.3.4.1 Cause of injury in electrical work
    - 1.3.4.2 Effects of electricity on the body
    - 1.3.4.3 Circuit overloading

1.3.5 Mechanical safety
1.3.5.1 Cause of injury in mechanical work
1.3.5.2 Rotating equipment
1.3.5.3 Sharp edges

1.4 Safety Devices
1.4.1 Residual current device (RCD)
1.4.2 Fuses
1.4.3 Guards
1.4.4 Sensors

2. Risk assessment and identify control measures (07 Hours)

2.1 Risk assessments: five steps
2.1.1 Principal hazards
2.1.2 Who is likely to be injured/ harmed?
2.1.3 Evaluate the risks and decide on adequacy of precautions
2.1.4 Recording findings
2.1.5 Review assessment

2.2 Use of control measures:
2.2.1 Use of recognized procedures
2.2.2 Substances control
2.2.3 Guarding
2.2.4 Lifting assessments and manual handling assessments
2.2.5 Regular inspection
2.2.6 Use of Personal Protective Equipment (PPE)
2.2.7 Training of personnel
2.2.8 Other personal procedures for health, safety and welfare

3. Methods used when reporting and recording accidents and incidents. (05 Hours)

3.1 Why employers keep records of serious accidents, incidents and emergencies
3.2 Responsibilities of competent persons
3.3 Cost of accidents
3.4 Recording of trends such as major causes, fatal and serious injury
3.5 Methods of classification
3.6 Statistics
3.7 Recording and reporting procedures
3.7.1 Accident book, company procedures
3.7.2 Procedures to deal with near miss or dangerous occurrences

4. Workstation/ workshop designing. (10 Hours)

4.1 Setting arrangements of Computer Labs/ workshop
4.2 Workstation setting
4.3 Cleaning and maintenance procedure
4.4 Electrostatic Discharge Precaution and Procedure
4.5 Working Posture

Reference Books.

Safety Practices and Procedures by NISTE
Health and Safety Executive — *A Guide to Risk Assessment Requirements: Common Provisions in Health and Safety Law* (HSE Books, 1996) ISBN 0717612112
Health and Safety Executive — *Management of Health and Safety at Work* (HSE Books, 2000) ISBN 0717624889

OHSE -111 OCCUPATIONAL SAFETY, HEALTH AND ENVIRONMENT

INSTRUCTIONAL OBJECTIVES

1. Understand how to Identify and control of Hazards

1.1 Understand methods of identify hazards with in the work place.
- 1.1.1 Discuss the role of statements
- 1.1.2 Describe the analysis of significant risks
- 1.1.3 Discuss the prediction of results or outcomes of the risks
- 1.1.4 Discuss the use of accident data
- 1.1.5 Describe the careful consideration of work methods

1.2 Understand the consideration of the workplace and its potential for harm.
- 1.2.1 Describe confined spaces
- 1.2.2 Discuss working at heights
- 1.2.3 Discuss Electrical hazards
- 1.2.4 Discuss Chemicals related to hazards
- 1.2.5 Discus role of noise.

1.3 Understand Hazards which become risks:
- 1.3.1 Able to identification of minor or major risk
- 1.3.2 Describe potential to cause harm
- 1.3.3 Able to choosing appropriate control measures
- 1.3.4 Understand Electrical safety
  - 1.3.4.1 Describe cause of injury in electrical work
  - 1.3.4.2 Describe effects of electricity on the body
  - 1.3.4.3 Describe circuit overloading
- 1.3.5 Understand Mechanical safety
  - 1.3.5.1 Describe cause of injury in mechanical work
  - 1.3.5.2 Discuss the role of rotating equipment in hazards.
  - 1.3.5.3 Discuss the role of sharp edges in hazards.

1.4 Understand role of Safety Devices
- 1.4.1 Understand the role of residual current device (RCD)
- 1.4.2 Understand the role of fuses
- 1.4.3 Understand the role of guards
- 1.4.4 Understand the role of sensors

2. Risk assessment and identify control measures

2.1 Understand five steps Risk assessments
- 2.1.1 principal hazards
- 2.1.2 who is likely to be injured/harmed
- 2.1.3 evaluate the risks and decide on adequacy of precautions
- 2.1.4 recording findings
- 2.1.5 review assessment

2.2 Understand the use of control measures
- 2.2.1 Discuss use of recognized procedures
- 2.2.2 Discuss substances control

2.2.3 Discuss guarding
2.2.4 Discuss lifting assessments and manual handling assessments
2.2.5 Discuss regular inspection
2.2.6 Discuss use of Personal Protective Equipment (PPE)
2.2.7 Discuss training of personnel
2.2.8 Discuss other personal procedures for health, safety and welfare

3. Understand the Methods used when reporting and recording accidents and incidents.

3.1 Discuss why employers keep records of serious accidents, incidents and emergencies
3.2 Describe the responsibilities of competent persons
3.3 Discuss cost of accidents
3.4 Discuss recording of trends such as major causes, fatal and serious injury
3.5 Discuss methods of classification
3.6 Discuss statistics used in recording
3.7 Understand Recording and reporting procedures
3.7.1 Describe accident book, company procedures
3.7.2 Discuss the procedures to deal with near miss or dangerous occurrences

4. Understanding Workstation/ workshop designing.

4.1 Discuss setting arrangements of Computer Labs/ workshop
4.2 Describe Workstation setting
4.3 Explain cleaning and maintenance procedure
4.4 Describe Electrostatic Discharge Precaution and Procedure
4.5 Understand Working Posture

Course Code: **CIT 112**	**T**	**P**	**C**
Course Title: **Computer Application Software**	**0**	**6**	**2**

An application-oriented course on basic use of computers. It aims to provide the students in their first year the experience of using the machine hands-on. The course covers the immediate application of computers in business and daily use. It covers the topics on how to use the computers and useful application programs in graphical user interface.

Course Objectives

At the end of the course the students are expected to be able to

- Identify and describe the use and function of external parts of a microcomputer from an end-user point of view.
- Understand the basic operations and use of current operating system
- Run and use application programs
- Use the computer for daily business activities
- Use keyboard and mouse correctly and with ease
- Appreciate the usefulness of computer in work and daily activities

COURSE OUTLINE

Practical Contents	**Hours**
1. **Introduction to Computer: End-User Point of View** 1.1. Basic Design of Computer 1.2. Hierarchy of Memory 1.3. External View of Computer 1.4. Input and Output Devices	**6**
2. Windows Operating System 2.1. Computer Bootstrap 2.2. Window Objects and Application Programs 2.3. File System 2.4. Windows Explorer and Windows Help	**12**
3. Word Processing 3.1. Opening and Closing Word Processor Application Program 3.2. Opening, Saving and Closing Document 3.3. Editing and Navigating Documents 3.4. Document Views and Printing Documents 3.5. Formatting Document and Inserting Objects 3.6. Enhancement and Tools and Tables	**32**

4. Spread Sheet **32**

4.1. Opening and Closing Spread Sheet Application Program
4.2. Data Types
4.3. Entering and Editing Data
4.4. Worksheets and Workbooks
4.5. Data Manipulation
4.6. Printing Worksheet
4.7. Formatting Cells
4.8. Calculation Using Formula
4.9. Function and Function Wizard

5. Presentation **32**

5.1. Opening and Closing Presentation Application Program
5.2. Presentation Views
5.3. Entering and Editing Presentation Objects
5.4. Slides and Transition
5.5. Animation

6. Non-Procedural Interactive Database **32**

6.1. Opening and Closing Interactive Database Program
6.2. Creating Database Tables
6.3. Setting Up Database Tables
6.4. Creating Queries for Tables
6.5. Creating Data Entry Forms for Tables
6.6. Generating Reports from Tables

7. Internet **24**

7.1. Opening and Closing Internet Browser
7.2. E-Mail
7.3. Search Engine
7.4. Surfing the WWW

8. Graphics and Image **14**

8.1. Opening and Closing Scanning Software
8.2. Scanning pictures
8.3. Editing Graphics
8.4. Saving Graphics

9. Video **8**

9.1. Opening and Closing Video Software
9.2. Playing video

Total Hours: 192

References

- **Microsoft Office 6 in 1,** Peter Aiken, and others, Que Corporation
- **Teach Yourself Windows in 24 Hours**, Perry G., Sams Publishing
- **MS Office Unleashed**, Sams Publishing
- **Teach Yourself NETSCAPE Communicator**, Sams Publishing

CIT 112 – Computer Application Software

INSTRUCTIONAL OBJECTIVES

1. Introduction to Computer: End-User Point of View

1.1. Enumerate the main block components of computer
1.2. Describe the function of each component
1.3. Enumerate the components of hierarchy of memory
1.4. Identify the main external elements of computer
1.5. Describe the function of each external part of computer
1.6. Describe main input/output devices of computer
1.7. Name the keys of keyboard
1.8. Use keyboard and mouse correctly

2. Windows Operating System

2.1. Start a computer
2.2. List the steps computer takes to start
2.3. Identify the elements of Windows startup screen
2.4. Identify main parts of Windows window
2.5. Navigate Windows window
2.6. Launch application program from Windows
2.7. Describe the file system of Windows
2.8. Identify icons for files, folders and drives
2.9. Launch Windows Explorer
2.10. Navigate Windows Explorer
2.11. Identify icons, bars and elements of Explorer windows
2.12. Use Explorer to work on files and folders
2.13. Use Windows Help

3. Word Processing

3.1. Open (launch) and close Windows Word
3.2. Navigate Word window
3.3. Use menu bars and tool bars
3.4. Open document and operate it.
3.5. Edit and navigate document
3.6. Change views of document and print it
3.7. Format documents
3.8. Insert objects on Word document
3.9. Use Tools and enhancements of Word processor
3.10. Write formatted document in Word

4. Spread Sheet

4.1. Open (launch) and close Windows Excel
4.2. Navigate Excel window
4.3. Use menu bars and tool bars of Excel

4.4. Open Excel spreadsheet and work on it
4.5. Enter data in Excel spreadsheet
4.6. Edit, manipulate and navigate Excel spreadsheet
4.7. Format Excel cell
4.8. Print Excel workbook
4.9. Calculate cell values using formula
4.10. Use function and function wizard of Excel

5. Presentation

5.1. Launch (Open) and close Windows PowerPoint
5.2. Display PowerPoint slides in different views
5.3. Enter, edit and manipulate objects in slide show
5.4. Enhance the slide presentation with transition and animation
5.5. Create presentation in PowerPoint
5.6. Present slide show in PowerPoint

6. Non-Procedural Interactive Database

6.1. Open Windows Access
6.2. Create database and its tables
6.3. Define and setup properties of tables
6.4. Create and edit queries for tables
6.5. Create and edit forms for tables
6.6. Create and generate report for tables

7. Internet

7.1. Launch Windows Explorer and close it
7.2. Launch Netscape Internet browser
7.3. Navigate Windows Explorer and Netscape and use their tools and icons
7.4. Compose, send and receive electronic mail (email)
7.5. Manage mails of email
7.6. Search information from Internet through Windows Explorer or Netscape Navigator
7.7. Manipulate the information searched from Internet (save, print or forward)
7.8. Surf the World Wide Web

8. Graphics and Image

8.1. Open and close graphics software and scanners
8.2. Set up the graphics software and scanners
8.3. Scan, edit and save pictures
8.4. Use graphics software

9. Video

9.1. Launch video software and close it
9.2. Setup video software
9.3. Use video software
9.4. Play video clips

Course Code: **CIT 113**	**T**	**P**	**C**
Course Title: **Introduction to Computer Programming**	**2**	**3**	**3**

A general introduction to computing and first programming language course. It aims to introduce the students to computers and IT in general and provide the knowledge and skills to use high level programming language to solve problems. It covers general introduction to computers and IT and study of the celebrated C programming language. This has laboratory component to complement classroom discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the basic terminology and concepts of computer and Information Technology.
- Formulate logically problems and their solutions
- Use C programming language to solve problems
- Represent real-world information into computer data.
- Translate real-world problems into computer statement and solve them procedurally.
- Use input devices with ease and confidence
- Appreciate the clarity and conciseness of programming language and display patience in solving algorithmic problems

COURSE OUTLINE

Contents	**Hours**
1. Introduction to Computers	**2**
1.1. The History of Computers	
1.2. Computer Generations	
1.3. Hardware, Software, and Peopleware	
1.4. Programming Languages	
1.5. Categories of Programming Languages	
1.6. Machine Languages	
1.7. Symbolic or Assembly Language	
1.8. High-Level Languages	
1.9. Features of Programming Languages	
2. The Programming Cycle	**2**
2.1. Defining the Problem	
2.2. Planning and Coding Solution	
2.3. Checking and Debugging	
2.4. Importance of Readability and Documentation	
2.5. Flowcharting	

2.6. Flowchart Symbols
2.7. Advantages and Disadvantages of Flowcharts

3. The C Integrated Development Environment (IDE) **2**
3.1. IDE Setup and Use of IDE
3.2. Files used in C Program Developer
3.3. The Structure of C Programs

4. C Building Blocks **2**
4.1. Variable
4.2. Input/Output
4.3. Operators

5. Conditional Control Construct: Decisions **6**
5.1. The if Statement
5.2. The if-else Statement
5.3. The else-if Statement
5.4. The switch Statement
5.5. The Conditional Operator

6. Iterative Control Construct: Loops **6**
6.1. The for Loop
6.2. The while Loop
6.3. The do while Loop

7. Functions **8**
7.1. Introduction
7.2. Simple Functions and Value-Returning Functions
7.3. Parameter Passing
7.4. Using Multiple Functions and External Variable
7.5. Preprocessor Directives
7.6. Recursion

8. Arrays and Strings **6**
8.1. Introduction
8.2. Single and Two-dimensional Arrays
8.3. Strings

9. Pointers **10**
9.1. Introduction to Pointer
9.2. Returning Data from Functions
9.3. Pointers and Arrays
9.4. Pointers and Strings
9.5. Double Indirection: Pointers to Pointers

10. Structures and Unions **8**
10.1. Structures
10.2. Unions
10.3. Unions of Structures

11. Files **8**

11.1. Types of Disk I/O and Standard Input/Output
11.2. Binary and Text Mode
11.3. Record Input/Output and Random Access
11.4. Error conditions and Redirection

12. Larger Programs **8**

12.1. Making Stand-alone Executable
12.2. Separate Compilation and Conditional Compilations
12.3. Memory Models

Total Hours: 64

References

- Turbo C Programming for the PC and Turbo C++, Rev. Ed., Rober Lafore, The Waite's Group, Inc.
- C++ How to Program, 2Ed., Deitel and Deitel, Prentice-Hall
- Guide to C Programming, Jack Purdum, Ziff-Davis Press
- Mastering Turbo C, Stan Kelly-Bootle, Sybex Computer Books Inc.

CIT -113 Introduction to Computer Programming

LIST OF PRACTICALS

1. Installation and Setup of C Compiler
2. Navigation of Integrated Development Environment
3. Use of Program Editor
4. Cycle of Writing C Program
5. Program: Input/Output
6. Program: Mathematical Operations
7. Program: Mathematical Operations with Conditional Statements
8. Program: Mathematical Operations with Iterations
9. Program: Functions
10. Program: Passing Parameters to Functions
11. Program: Recursion
12. Program: Emulation of String Functions
13. Program: One Dimensional Array
14. Program: Two Dimensional Array
15. Program: Structure and Records
16. Program: Pointers and Link List
17. Program: File Handling
18. Programming Project

CIT 113 – Introduction to Computer Programming

INSTRUCTIONAL OBJECTIVES

1. Introduction with the Computers and Programming Languages
- 1.1. Discuss computer development
- 1.2. Describe computer generations
- 1.3. Describe electronic data processing
- 1.4. Explain the terms: hardware , software, and peopleware
- 1.5. Explain advantages of EDP
- 1.6. Discuss programming languages
- 1.7. Explain categories of programming languages
- 1.8. Describe machine language
- 1.9. Describe symbolic or assembly language
- 1.10. Describe high-level languages
- 1.11. Explain features of programming languages

2. Programming Cycle
- 2.1. Describe the programming cycle
- 2.2. Explain importance of readability and documentation
- 2.3. Describe Flowcharts
- 2.4. Cite advantages and disadvantages of flowcharting
- 2.5. Draw flowchart of procedures

3. The C Integrated Development Environment (IDE)
- 3.1. Demonstrate setting up the IDE
- 3.2. Explain files used in c program developer
- 3.3. Explain the use of IDE
- 3.4. Explain the structure of c programs

4. C Building Blocks
- 4.1. Define variable
- 4.2. Explain Input/Output
- 4.3. Enumerate operator symbols in C
- 4.4. Explain the use these operators

5. Conditional Control Construct: Decisions
- 5.1. Demonstrate use of the if Statement
- 5.2. Demonstrate use of the if-else Statement
- 5.3. Demonstrate use of the else-if Statement
- 5.4. Demonstrate use of the switch Statement
- 5.5. Write C functions using conditional statements

6. Iterative Control Construct: Loops
- 6.1. Demonstrate use of the for Loop
- 6.2. Demonstrate use of the while Loop

6.3. Demonstrate use of the do while Loop
6.4. Write C functions using iterations

7. Functions
7.1. Explain Functions
7.2. Explain Simple Functions
7.3. Explain Value-Returning Functions
7.4. Perform Parameter Passing
7.5. Demonstrate use of Multiple Functions
7.6. Describe External Variable
7.7. Explain Preprocessor Directives

8. Arrays and Strings
8.1. Describe Array Data Types
8.2. Demonstrate use of Single and Two-dimensional Arrays
8.3. Explain Strings

9. Pointers
9.1. Explain Pointers
9.2. Describe how to Return Data from Functions
9.3. Explain Pointers and Arrays
9.4. Explain Pointers and Strings
9.5. Demonstrate use of Double Indirection: Pointers to Pointers

10. Structures and Unions
10.1. Demonstrate use of Structures
10.2. Demonstrate use of Unions
10.3. Demonstrate use of Unions of Structures

11. Files
11.1. Explain Types of Disk I/O
11.2. Explain Standard Input/Output
11.3. Explain Binary and Text Mode Files
11.4. Program Record Input/Output
11.5. Explain Random Access Files
11.6. Explain Error Handling in File I/O
11.7. Explain Redirection

12. Larger Programs
12.1. Make Stand-alone Executables
12.2. Perform Separate Compilation
12.3. Perform Conditional Compilations
12.4. Explain Memory Models

Course Code: IOT-112	T	P	C
Course Title: **Python Programming**	**1**	**3**	**2**

This course is a professional course of Internet of Things application technology, which is mainly teaches the basic elements of Python programming language, including basic data types, operations, control structures, functions and so on. Besides, it also teaches the concept and application of data structures such as list, tuple, dictionary, string and class in python, as well as the basic ideas and methods of structured programming, so as to cultivate a good programming style. After learning this course, students can use computers to solve many practical problems.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the basic knowledge of Python programming;
- Master the basic methods of programming;
- Master the basic theory, method and application of programming;
- Able to read and write more complex programs;
- Ability to solve practical application problems using Python;
- Have certain knowledge exploration and reflection ability and innovation consciousness;
- Have independent learning ability and team spirit

COURSE OUTLINE

Contents	***Hours***
1. Basic grammar	**2**
1.1. Variables and data types;	
1.2. Expression.	
2. Flow control	**2**
2.1. Conditional statement；	
2.2. Conditional flow control；	
2.3. Cyclic flow control.	
3. Combined data type	**6**
3.1. List;	
3.2. Tuple;	
3.3. Dictionary;	
3.4. Set.	
4. Strings and regular expressions	**4**
4.1. String base;	
4.2. String method;	

4.3. Regular expression.

5. Function **4**

5.1. Overview of functions；

5.2. The arguments and return values of the function；

5.3. Function call.

6. Module **2**

6.1. Module overview;

6.2. Installing a Third-Party Module;

6.3. Module application example;

6.4. Call R in Python.

7. Classes and objects **6**

7.1. Understanding object orientation;

7.2. Class definition and usage;

7.3. Class characteristics.

8. Anomaly **2**

8.1. Exception overview；

8.2. Exception handling flow；

8.3. Custom exception.

9. File manipulation **4**

9.1. Open file;

9.2. Basic file methods;

9.3. String I/O function;

9.4. Basic directory methods.

Total Hours:	***32***

References

- **Python Programming from Introduction to Practice**, Eric Matthes, Posts and Telecommunications Press
- **Learn Python on zero basis**, Mingri Soft, Posts and Telecommunications Press
- **Python Programming** by Sana Rasheed, Gufhtugu publications Islamabad
- **Cracking codes with Python** by Al Sweigart
- **A python book** by Dave Khulman

IOT-112 – Python Programming

Instructional Objectives

Course contents

1. Basic grammar
- 1.1. Master the use of variables and data types;
- 1.2. Master the use of expressions.

2. Flow control
- 2.1. Master the use of conditional statement；
- 2.2. Master the use of conditional flow control；
- 2.3. Master the use of cyclic flow control.

3. Combined data type
- 3.1. Master the use of list;
- 3.2. Master the use of tuple;
- 3.3. Master the use of dictionary;
- 3.4. Master the use of set.

4. Strings and regular expressions
- 4.1. Master the use of string;
- 4.2. Master the use of regular expression.

5. Function
- 5.1. Understand the basic format of functions；
- 5.2. Master the use of function call.

6. Module
- 6.1. Master the use of module;
- 6.2. Learn how to call R in Python;
- 6.3. Know how to install third-party modules.

7. Classes and objects
- 7.1. Understand object orientation;
- 7.2. Master the definition and usage of classes;
- 7.3. Master the class characteristics.

8. Anomaly
- 8.1. Master the exception handling flow；
- 8.2. Master the Custom exception.

9. File manipulation
- 9.1. Learn how to create and open files;
- 9.2. Master basic document methods;
- 9.3. Master the use of String I/O functions.

LIST OF PRACTICAL IOT-112

1. Installing Python 3 and PyCharm
2. Use of PyCharm
3. Cycle of Writing C Program
4. Program: Designing Holiday Cards
5. Program: Use of Constants and Variables
6. Program: Use of Flow Control Statements
7. Program: Use of Lists
8. Program: Use of Tuples
9. Program: Use of Set
10. Program: Use of Dictionary
11. Program: Use of String
12. Program: Use of Closures and Recursive Functions
13. Program: Use of Datetime Module
14. Program: Class Inheritance and Polymorphism
15. Program: Exceptions with Zero Divisor are Handled Using Try-except
16. Program: File Handling
17. Programming Project

Course Code: **CIT 121**	**T**	**P**	**C**
Course Title: **General Engineering Workshop**	**0**	**3**	**1**

An introductory laboratory course of the practice and techniques on electrical and electronics circuits. It aims to provide students with hands-on experience in using tools and techniques in working with electrical and electronics circuits. The course includes exercises in soldering, PCB fabrication, and basic wiring techniques. The course consists on all Lab Work.

Course Objectives

At the end of the course the students are expected to be able to

- Understand correct methods and techniques of using appropriate tools and instrument for fabrication and assembly of electrical and electronics devices and circuits.
- Use these tools proficiently and apply these correct methods and techniques for electric wiring and soldering.
- Fabricate and assemble electrical and electronics devices accurately, efficiently and with confidence
- Demonstrate patience and care in using tools and equipment

CONTENTS (Practical)

Practical Contents	**Hours**
1. Soldering	**15**
1.1. Use of Basic Tools	
1.2. Use of Soldering and De-soldering Tools	
1.3. Soldering Techniques	
2. PCB Design	**36**
2.1. PCB Designing	
2.2. Selection of PCB	
2.3. Cutting Sheets	
2.4. Transfer of Circuit	
2.5. Chemical Etching Process	
2.6. Identification and Codes	
2.7. Mounting and Soldering Components	
2.8. PCB Tests	
3. Basic Wiring	**15**
3.1. Introduction to Electrical Wiring	
3.2. Wiring Standard and Symbols	

3.3. Types and Sizes of Wiring Cables
3.4. Wiring System
3.5. Wiring
3.6. Wiring Accessories
3.7. Earthing

4. Simple Wiring Circuits **15**

4.1. Single Lamp Circuit
4.2. Stair Case Wiring Circuit
4.3. Lamps in Parallel
4.4. Telephone Wiring
4.5. Color Codes

5. Use of Computer repair tools and equipment **15**

5.1 Screw Driver
5.2 Nut driver
5.3 Torx Driver
5.4 Plier
5.5 Wire Cutter
5.6 Wire Stripper
5.7 Chip Extractor
5.8 Chip Inserter
5.9 Straps, Zip ties and Tie-down
5.10 ESD Component Protection and Storage.

Total Hours: 96

References

- **Electrical Wiring, Estimating and Costing**, S.L. Uppal, Khanna Publishers
- **Handbook of Printed Circuit Manufacturing**, R. Clark, Van Nostrand Reinhold Company
- **Industrial Control Wiring**, Bob Mercer, Newnes, Butterworth-Heineman, Ltd.
- **A+: Core Module Study Guide**, David Groth, Sybex Inc.
- **How to Read and Interpret Schematic Diagram**, J. R. Johnson, Hayden Book Company
- **Basic Electricity: A Text-Lab Manual**, P. Zbar & G. Rockmaker, McGraw-Hill

Course Code: **CIT- 134**	**T**	**P**	**C**
Course Title: **Electronics – I**	**3**	**3**	**4**

The electrical and electronics foundation course on theory and practice in electromagnetism, electrical networks and electronic devices. This is designed to provide students with necessary knowledge to understand the applied physical principles in basic electronics. It covers the standard topics in electromagnetism and electronics such as AC/DC, circuits, transformers and semiconductors, among others. This is accompanied by laboratory course to strengthen the classroom discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand qualitatively and quantitatively basic concepts and principles of electromagnetism, linear circuits and basic electronics.
- State and explain the operating principles applied to electrical and electronic devices. Apply the concepts and principles to solve related practical technological problems.
- Relate electronic and electrical concepts and principles to other discipline of study
- Observe accurately and manipulate electrical measuring instruments effectively and efficiently with confidence
- Display motivation in solving complex problems and appreciate the impact of this field of knowledge in technology

COURSE OUTLINE

Contents	**Hours**

COURSE CONTENTS.

(Part-A)

1. BASIC PRINCIPLE OF ELECTRICITY (4 Hours)

1.1 Electron Theory

1.1.1 Structure of atom, K, L and M shell, energy levels and valence electrons.

1.1.2 Energy bands with reference to conductors, insulators and semiconductor.

1.2 Electrical Quantities

1.2.1 Potential, current and resistance.

1.2.2 Units of potential, current and resistance.

1.2.3 Conventional and electron current

2. DC FUNDAMENTALS. (14 Hours)

2.1 Ohm's Law

2.1.1 Definition of Ohm's law.

2.1.2 Problems on Ohm's Law.

2.2. Laws of Resistance

2.2.1 Specific Resistance, conductance and conductivity.

2.2.2 Effect of temperature on resistance and temp. Coefficient of resistance.

2.2.3 Problems on $R = \rho \times L/A$ and $R_t = R_o (1 + \alpha t)$

2.2.4 Resistance in series, parallel and series-parallel

2.2.5 Calculations on combination of resistance and cells in series, parallel and series-parallel combinations.

2.2.6 Power and Energy their units and calculations.

2.2.7 Power dissipation in resistors.

2.3 Kirchhoff's Laws

2.3.1 Introduction of Kirchhoff's Laws.

2.3.2 Calculation using KVL and KCL by loop and node methods.

2.4 Resistors

2.4.1 Resistor construction and types.

2.4.2 Application of resistors.

2.4.3 Resistors color coding , Power rating.

2.4.4 Resistor, troubles.

2.5 Batteries

2.5.1 Types of DC sources.

2.5.2 Types of cells, Primary and secondary cells (Mercury, silver oxide, Nickel-cadmium, etc.)

2.5.3 Lead acid batteries.

2.5.4. Solar cell.

2.5.5 Internal resistance of a cell.

2.5.6 Application of cell as constant voltage and constant current source.

3. ELECTROSTATICS. (10 Hours)

3.1 Principle of electrostatic, positive and negative charges.

3.2 Laws of electrostatic.

3.3 Electrostatic induction and field strength.

3.4 Properties of electric lines of force and comparison with magnetic lines.

3.5. Dielectric, dielectric strength and its importance permittivity and break down voltage.

3.6 Capacitance and capacitors. Capacitance of parallel plate capacitor.

3.7 Types and uses of capacitors.

3.8 Equivalent capacitance for series, parallel and series parallel combination of capacitors.

3.9 Energy stored in capacitors.

3.10 Colour code, tolerance and rating of capacitors.

3.11 Troubles in capacitors.

4. MAGNETISM AND ELECTROMAGNETISM. (10 Hours)

4.1 Magnetism.

4.1.1 Introduction to magnetism, magnetic line of force, flux, flux-density, permeability, Reluctance and their units.

4.1.2 Properties of magnetic lines of force.

4.1.3 Types of magnets.

4.1.4 Magnetic properties of materials (ferro-, para- and dia-magnetic) magnetic induction.

4.2 Electromagnetism.

4.2.1 Electromagnetism, M.M.F. (AT) field intensity (H =AT/L) ampere turns/meter.
4.2.2 Electromagnetic induction.
4.2.3 Force between two magnetic fields and motor action.
4.2.4 Faraday's Law of Electromagnetic induction (R=NdΦ/dt.)
4.2.5 Lenz's Law.

5. AC FUNDAMENTALS. (10 Hours)

5.1 The simple AC generator.
5.1.1 Sine wave, cycle, wavelength, period, frequency and units.
5.1.2 AC sine wave form and its characteristics. (Instantaneous, peak, average, rms or effective values and their inter relation).
5.1.3 Audio and Radio frequencies, wavelengths and periods frequency spectrum.
5.1.4 Types of alternating wave forms(sinusoidal and non-sinusoidal waves). Fundamental wave and harmonics.

5.2 AC Circuits
5.2.1 AC through pure resistance, Phaser quantities.
5.2.2 Phase angle, in-phase, out of phase waves and phase lag & lead and power factor.
5.2.3 Calculation of V,I and W for resistive circuits through inductance.
5.2.4 Self inductance, and self induced voltage.
5.2.5 Inductive reactance ($X_L=2\pi fL$) Phase relation between V & I.
5.2.6 Phaser diagram and power for pure inductor.
5.2.7 AC through R-L series circuit.
5.2.8 Phaser diagram and power in a R-L series circuit.
5.2.9 Time constant ,τ =L/R, and its effect.
5.2.10 Impedance, Impedance triangle.
5.2.11 AC through R-L parallel circuit.
5.2.12 Inductive reactance in series, parallel and series-parallel combination.
5.2.13 Skin effect, AF and RF chokes.
5.2.14 Troubles in chokes.
5.2.15 AC through pure capacitor. Phase relation between V&I and power.
5.2.16 Capacitive reactance
5.2.17 AC through R-C series circuit.
5.2.18 Time constant RC and its effect.
5.2.19 Impedance, Impedance triangle.
5.2.20 AC through R-C parallel circuit.
5.2.21 Capacitive reactance in series, parallel, and series parallel combination.
5.2.22 AC through RLC series circuit, phase relation and power calculation.
5.2.23 AC through RLC parallel circuit phase relation and power calculation.
5.2.24 Simple calculations for RLC circuits.
5.2.25 Concepts of real Power (VI CosΦ) and apparent power (VA), power factor. simple calculations.

(Part-B)

6. TRANSFORMER (6 Hours)

6.1 Principle of transformer, mutual inductance, coefficient of mutual inductance.
6.2 Turn ratio and e.m.f. equation
6.3 Construction, types of transformers, core materials.

6.4 Application of transformers in electronics.
6.5 Auto-transformers, principle, advantages, disadvantages and applications.
6.6 Transformer losses.
6.6.1 Core loss.
6.6.2 Hysteressis loss.

7. RESONANCE. (8 Hours)

7.1 Condition of resonance and resonant circuit.
7.2 Relation between f, L and C at resonance.
7.3 Series resonant circuit. Impedance of series resonant circuit.
7.4 Current, voltage and impedance characteristic of series resonant circuit.
7.5 Parallel resonant circuit and its impedance
7.6 Characteristics of impedance, current and voltage of a parallel resonant circuit
7.7 Series and parallel resonance curve comparison and Bandwidth.
7.8 Use of resonance circuit.

8. FILTER & COUPLING CIRCUITS (8 Hours)

8.1 Purpose and action of a filter circuit.
8.2 Principle of filter action.
8.3 Types of filter circuit LPF, HPF, K filter and m drive filter.
8.4 Band Pass filter (BPF) Band Stop filter (BSF)
8.5 Power supply filter.
8.6 Purpose and action of coupling circuit.

9. DIODES AND APPLICATIONS. (12 Hours)

9.1 Semiconductors
9.1.1 Semiconductor Doping
9.1.2 Intrinsic & Extrinsic Semiconductors
9.2 Biasing the PN junction.
9.2.1 Depletion region, Junction barrier potential
9.2.2 Forward and reverse bias.
9.3 Rectifier Diode.
9.3.1 Half wave and full wave (Bridge) rectifier.
9.3.2 Ripple factor, surge current.
9.3.3 Rectifier filter: L, PI and T filters.
9.6 Diode as a switch.

10. NUMBER SYSTEM. (Review) (04 Hours)

10.1 Conversion
10.1.1 Binary to Decimal.
10.1.2 Decimal to Binary.
10.1.3 Hexadecimal to Binary.
10.1.4 Binary to Hexadecimal.
10.1.5 Hexadecimal to Decimal.
10.1.6 Decimal to Hexadecimal.

11. LOGIC GATES. (10 Hours)

11.1 Logic Gates.
11.1.1 Symbols, Circuits and functions of OR, AND, NOT, NAND, NOR Gates.

11.1.2 Truth Table and Boolean expression of each above mentioned Gates.
11.1.3 Creating Multiple Input Gates.

11.2 Duality of Logic Functions.
11.2.1 Using NOR Gates to emulate all Logic Functions.
11.2.2 Using NAND Gates to emulate all Logic Functions.

11.3 The Exclusive OR and Exclusive NOR Functions.
11.3.1 Symbols, Circuits and functions of XOR, XNOR Gates.
11.3.2 Truth Table and Boolean expression of both above mentioned Gates.

TEXT / REFERENCE BOOKS.

1. Bird J O — *Electrical and Electronic Principles and Technology, Second Edition* (Newnes, 2004) ISBN 0750665505
2. Bird J O — *Electrical Circuit Theory and Technology* (Newnes, 2004) ISBN 0750657847
3. Grob, Bernard, *Basic Electronics*, Eight Edition.
4. TL Floyd "Electronics Devices" 8th ed. Prentice Hall, ISBN 0131140809
5. Floyd "Digital Fundamentals"

CIT -134 ELECTRONICS -1

INSTRUCTIONAL OBJECTIVES

1. BASIC PRINCIPLE OF ELECTRICITY.

1.1 Understand electron theory.

1.1.1 Describe the structure of atom.
1.1.2 Describe the K, L, and M shells.
1.1.3 Describe energy level.
1.1.4 Describe valence electron.
1.1.5 Explain energy bands with reference to conductors, insulators & semiconductors.

1.2 Understand Electrical Quantities

1.2.1 Describe potential, current & resistance
1.2.2 Describe units of potential, current & resistance
1.2.3 Differentiate between conventional current and electron current.

2. DC FUNDAMENTALS.

2.1 Understand Ohm's Law.

2.1.1 Define ohm's law
2.2.2 Solve problems on Ohm's law

2.2 Understand Laws of Resistance

2.2.1 Define specific resistance
2.2.2 Define conductor
2.2.3 Define conductivity
2.2.4 Explain the effect of temperature on resistance
2.2.5 Explain coefficient of resistance
2.2.6 Solve problems on $R = \rho \times L/A$ and $R_t = R_o (1+xt)$.
2.2.7 Describe the resistance in series
2.2.8 Describe the resistance in parallel
2.2.9 Describe the resistance in series-parallel
2.2.10 Calculate the combination of resistances and cells, R_t, I & V.
2.2.11 Define power and energy
2.2.12 Describe units of power and energy
2.2.13 Explain the power dissipation in resistors

2.3 Understand Kirchhoffs' Laws

2.3.1 Define Kirchhoff's laws
2.3.2 Solve problems using Kirchhoff voltage law
2.3.3 Solve problems using Kirchhoff current law

2.4 Understand Resistors

2.4.1 Define resistance and resistor
2.4.2 List types of resistors
2.4.3 Enlist use of resistors
2.4.4 Describe resistor color codes

2.4.5 Describe power rating of resistor

2.5 Understand Batteries

2.5.1 Name types of D.C source
2.5.2 Describe types of cells (Mercury, Silver oxide, Nickel cadmium)
2.5.3 Describe lead acid battery
2.5.4 Describe solar cells
2.5.5 Explain the internal resistance of cell
2.5.6 Use cells in series and parallel of voltage and constant source of current

3. ELECTROSTATICS.

3.1 Understanding Electrostatics

3.1.1 Describe principle of electrostatic charges
3.1.2 Explain the effect of negative & positive charges
3.1.3 Describe the laws of electrostatics
3.1.4 Describe electrostatic induction & field strength
3.1.5 Explain properties of electric lines of force
3.1.6 Compare between electric lines of force and magnetic lines of force
3.1.7 Describe dielectric & dielectric strength/dielectric constant
3.1.8 Describe the importance of dielectric & dielectric strength
3.1.9 Describe capacitor and capacitance
3.1.10 Describe breakdown voltage
3.1.11 Describe the capacitance of parallel plate capacitor
3.1.12 Describe types of capacitors
3.1.13 Describe the use of capacitors
3.1.14 Calculate the total capacitance in series in parallel and series-parallel combination
3.1.15 Explain the energy stored in capacitor
3.1.16 Describe the colour coding, tolerance and voltage rating of capacitors
3.1.17 Describe the troubles in capacitors

4. MAGNETISM & ELECTROMAGNETISM

4.1 Understand magnetism

4.1.1 Describe lines of force, flux, flux density, permeability, reactance & their units
4.1.2 Explain properties of magnetic lines of force
4.1.3 Describe types of magnets
4.1.4 Explain magnetic properties of materials
4.1.5 Define and list ferromagnetic, paramagnetic and diamagnetic materials.
4.1.6 Describe magnetic induction.

4.2 To understand electromagnetism

4.2.1 Describe electromagnetism
4.2.2 Describe magneto-motive force
4.2.3 Describe field intensity (H=AT/L)
4.2.4 Describe magnetic hystersis
4.2.5 Explain electromagnetic induction
4.2.6 Explain magnetic field around a current carrying conductor
4.2.7 Define inductor
4.2.8 Explain force between two magnetic fields and motor action

4.2.9 Define Faraday's law of electromagnetic induction ($e = Nd\Phi/dt$)
4.2.16 Define Lenz's Law

5. AC FUNDAMENTALS.

5.1 Understand A.C Waveform

5.1.1 Describe sine wave (cycle, wave length, period, frequency and their units)
5.1.2 Draw AC sine waveform (sinusoidal, square, saw tooth)
5.1.3 Describe Instantaneous value, peak value, average value, r.m.s. value, effective value and their inter-relation
5.1.4 Describe Audio & Radio frequencies and their wavelengths
5.1.5 Draw the electromagnetic wave spectrum
5.1.6 Define harmonic and fundamental wave.

5.2 Understand AC circuits

5.2.1 Describe AC through resistors
5.2.2 Describe phase angle, in phase & out of phase waves
5.2.3 Describe phase lag, lead & power factor
5.2.4 Calculate voltage, current & power(v,i,w) for resistive circuit
5.2.5 Describe AC through inductance using waveforms and phasor diagram
5.2.6 Define self inductance & self induced voltage
5.2.7 Explain inductive reactance ($X_L=2\pi fL$), phase relation between voltage & current
5.2.8 Draw its phaser diagram
5.2.9 Calculate power for pure inductor
5.2.10 Explain AC through R-L series circuit
5.2.11 Draw phaser diagram for R-L series circuit
5.2.12 Calculate power factor for R-L series circuit
5.2.13 Calculate time constant for L/R
5.2.14 Define impedance
5.2.15 Draw impedance triangle
5.2.16 Explain AC through R-L parallel circuit
5.2.17 Calculate inductive reactance for series, parallel and series-parallel inductor
5.2.18 Describe skin effect
5.2.19 Describe audio frequency chokes
5.2.20 Describe radio frequency chokes
5.2.21 Explain ac through pure capacitor
5.2.22 Explain phase relation between voltage, current & power for AC through capacitors
5.2.23 Calculate capacitive reactance ($\frac{1}{2} \pi f C$)
5.2.24 Explain AC through R-C series circuit
5.2.25 Explain time constant for R-C series circuit
5.2.26 Explain AC through R-C parallel circuit
5.2.27 Calculate capacitive reactance for capacitor in series, in parallel and series parallel combination
5.2.28 Explain AC through RLC series circuit
5.2.29 Explain phase relation
5.2.30 Calculate power for RLC series circuit

5.2.31 Explain real power (VI Cos Φ), apparent power (VI)
5.2.32 Calculate power factor

6. TRANSFORMER.

6.1 Understand the transformers
- 6.1.1 Explain the principle of transformer
- 6.1.2 Define mutual induction
- 6.1.3 Define coefficient of mutual induction
- 6.1.4 Describe turn ratio of transformer
- 6.1.5 Describe construction of transformer
- 6.1.6 Enlist the types of transformer
- 6.1.7 Enlist core material of transformer
- 6.1.8 Describe auto transformer
- 6.1.9 List the applications of transformer in electronics:
  - i) step down transformer,
  - ii) impedance matching
  - iii) coupling
- 6.1.10 Explain transformer losses.
- 6.1.11 Explain hysteresis loss and core loss.

7. UNDERSTAND RESONANCE

7.1 Explain resonance
7.2 Explain the relation between frequency, inductance & capacitance at resonant
7.3 Draw the series resonant circuit
7.4 Explain series resonant circuit
7.5 Draw the characteristics of series resonant circuit
7.6 Calculate current, voltage and impedance of series resonant circuit
7.7 Draw the diagram of parallel resonant circuit
7.8 Explain the parallel resonant circuit
7.9 Draw the characteristics of parallel resonant circuit
7.10 Compare series and parallel resonant circuit
7.11 Describe the band width of a resonant circuit
7.12 Enlist the use of resonant circuit.

8. UNDERSTAND FILTERS & COUPLING CIRCUITS

8.1 Explain purpose & action of a filter circuit
8.2 Enlist the types of filter circuits
8.3 Explain low pass filter high pass filter, K-filter & m-derived filters
8.4 Explain band pass filter & band stop filter
8.5 Explain action & purpose of a coupling circuit

9. SEMICONDUCTOR DIODES.

9.1 Understand principles, characteristics and application of various types of semiconductor diodes.
- 9.1.2 Explain semiconductor doping
- 9.1.3 List donor and acceptor materials for silicon & germanium
- 9.1.4 Define majority carries and minority charge carriers.
- 9.1.5 Explain the effect of temperature & light on the resistance of
  (a) intrinsic semiconductor and

(b) Extrinsic semiconductor

9.2 PN Junction Theory:

9.2.1 Draw a PN Junction

9.2.2 Define the terms depletion layer capacitance & diffusion capacitance.

9.2.3 Sketch the voltage-current characteristics curve for a PN junction.

9.2.4 Describe R_F, R_R and I_s from the diode characteristics curve.

9.2.5 List the typical values of barrier potentials for silicon and germanium diode.

9. 3 Understand PN Diode Applications

9.3.1 List the uses of PN diode.

9.3.2 Explain half and full wave rectifier using circuit diagram.

9.3.3 Define Ripple factor, surge current.

9.3.4 Explain function of rectifier (L, PI, T) filters

9.3.5 Explain its uses as voltage multiplier (doubler).

9.3.6 Explain the working of a voltage doubler circuit.

9.3.7 List the applications of voltage multiplier circuit.

9.3.8 Explain the operation of a diode as a switch.

10. NUMBER SYSTEM.

10.1 Convert one number system to another system

10.1.1 Convert Binary numbers into Decimal numbers.

10.1.2 Convert Decimal numbers into Binary numbers.

10.1.3 Convert Hexadecimal numbers into Binary numbers.

10.1.4 Convert Binary numbers into Hexadecimal numbers.

10.1.5 Convert Hexadecimal numbers into Decimal numbers.

10.1.6 Convert Decimal numbers into Hexadecimal numbers.

11. LOGIC GATES.

11.1 Explain Logic Gates.

11.1.1 Draw Symbols of OR gate.

11.1.2 Draw Circuit of two input OR gate.

11.1.3 Discuss function of OR gate.

11.1.4 Describe Truth Table of OR gate.

11.1.5 Describe Boolean expression for OR gate.

11.1.6 Repeat instructional objectives no. 11.1.1 to 11.1.5 for AND gate.

11.1.7 Repeat instructional objectives no. 11.1.1 to 11.1.5 for NOT circuit.

11.1.8 Repeat instructional objectives no. 11.1.1 to 11.1.5 for NOR gate.

11.1.9 Repeat instructional objectives no. 11.1.1 to 11.1.5 for NAND gate.

11.1.10 Create Multiple Input Gates.

11.2 Describe duality of Logic Functions.

11.2.1 Use NOR Gates to emulate all Logic Functions.

11.2.2 Use NAND Gates to emulate all Logic Functions.

11.3 Understand Exclusive OR and Exclusive NOR Functions.

11.3.1 Draw Symbols of XOR gate.

11.3.2 Draw Circuit of two input XOR gate.

11.3.3 Discuss function of XOR gate.

11.3.4 Describe Truth Table of XOR gate.

11.3.5 Describe Boolean expression for XOR gate.

11.3.6 Repeat instructional objectives no. 11.1.1 to 11.1.5 for XNOR gate.

CIT -134 ELECTRONICS-I 96 Hrs.

LIST OF PRACTICAL.

1. Study of Ammeter, Voltmeter and Multimeter.
2. a) Measurement of current, voltage and resistance.
   b) Verification of Ohm's Law by:
   Keeping the voltage constant.
   Keeping the resistance constant.
3. a) Verify the laws of series and parallel combination of resistances by
   i) Ohmmeter method.
   ii) Voltmeter-Ammeter method.
4. Determine temperature coefficient of resistance.
5. Verify Kirchhoffs' laws.
6. a) Measurement of power by:
   i) Voltmeter/Ammeter method.
   ii) Wattmeter.
   b) Measurement of Energy by:
   i) Wattmeter and clock method.
   ii) Energy meter.
7. a) Practice of resistor colour coding.
8. Combine cells in series and parallel and verify the net voltage.
9. a) Study of lead acid battery, practice and use of hydrometer and electrolyte preparation.
   b) Practice charging of a lead acid battery.
10. Study of various types of capacitors and their colour coding.
11. Verify laws of combination of capacitors.
12. Observe capacitor charging and discharging.
13. Study of sine wave on an oscilloscope and determine its peak, peak to peak, r.m.s. and average values of current and voltage.
14. Determine of wave length, time period and frequency of a given AC signal by oscilloscope.
15. Study the behavior of inductance and capacitance with AC and DC supplies.
16. a) Study of various type of transformers used in electronics field.
   b) Study of single-phase transformer and determine its transformation ratio.
17. Practice of core assembly and winding of the core type transformers.
18. Draw the forward & reverse characteristics of a P.N. junction diode.
19. Assemble a half wave diode rectifier circuit and observe its input and out put waveforms.
20. Assemble a full wave diode rectifier circuit with center tab transformer and observe its input and out put waveforms.
21. Assemble a full wave bridge rectifier circuit and observe its input and out put waveforms.
22. Demonstrate the working of diode as a switch with LED as a load.
23. Assemble two inputs OR gate with the help of discrete components and verify its logic operation.
24. Assemble two inputs AND gate with the help of discrete components and verify its logic operation.

24-26. Verify its operation. NOT, OR and AND IC Gates.

27. Verify the operation of NAND gate.
28. Verify the operation of NOR gate.

29-30. Use NOR and NAND gates to emulate all logic functions.

31. Assemble XOR gate and verify its operation.
32. Assemble XNOR gate and verify its operation.

GenC-212 Chinese Language-2

Total contact hours

Theory 64

T P C

Practical 0

2 0 2

AIMS There are 20 lessons (including 4-unit reviews) in this course. It is recommended to complete 8 lessons and the unit reviews in 32 class hours. After completing this course, students can master the advanced-basic Chinese language knowledge in the content of the course, and be able to reach and exceed **HSK level THREE**.

COURSE CONTENTS

Lesson 1 Pick up international students at the airport 3 hours

This lesson introduces grammatical knowledge such as "flexible use of interrogative pronouns" and "basic forms of clutch words", which requires students to use sequential words correctly and understand the contextual meaning of some special words.

1. Lesson 2 What would you like to drink 3 hours

This lesson introduces the rhetorical question form "can…?" and the related words "not only… but also...", and learn to express your needs correctly in communication.

2. Lesson 3 I'm kidding you 4 hours

This lesson explains the fixed structures "more and more", "more A, more B", etc., and understands how to praise in Chinese and how to deal with others' praise.

3. Lesson 4 I like winter best 4 hours

Through the description of weather, students can learn the usage of adverbs such as "often" and "always", which express frequency, and compare and describe similar phenomena.

UNIT REVIEW 1 (INCLUDING TESTS) 2 hours

Summarize the contents of Lesson 1-4, review key words and grammar knowledge, and help learners really consolidate their mastery. There are tests designed, which can detect what has been learned before, so as to check for leaks and fill gaps.

4. Lesson 5 I caught a cold 3 hours

This lesson learns the basic usage of "active" sentence, understands the expressions related to illness and medical treatment, and learns the language communication in hospital scenes.

5. Lesson 6 You are really careless 3 hours

Learn and summarize the usage of simple directional complements "V come" and "V leave", and master the basic expression of request and evaluation functions in daily communication.

6. Lesson 7 English black tea is healthy and delicious 4 hours

Understand how to express approximate numbers in Chinese, how to persuade others and how to express their basic attitude.

7. Lesson 8 I'm not a shopaholic 4 hours

This lesson is related to online shopping. Learn the expression "A is A, that is" and learn how to express your views from different angles.

UNIT REVIEW 2 (INCLUDING TESTS) 2 hours

This section leads students to review the knowledge points they have learned in the past, and conduct mid-term tests to test students' learning effect.

8. Lesson 9 Why did grandparents move 3 hours

This lesson introduces a life event related to "moving house", the expression of learning conditions and the extended meaning of directional complement through events.

9. Lesson 10 Eat hot pot for the first time 3 hours

This lesson introduces the way of having dinner in China through "hot pot" and some basic situations of Chinese restaurants, so as to help learners get a preliminary understanding of Chinese dining customs.

10.Lesson 11 Teacher Wang is going to change the house 4 hours

This lesson is related to "housing" in "food, clothing, housing and transportation". While understanding the story, students can learn language knowledge such as hypothetical relationship and overlapping of disyllabic verbs.

11.Lesson 12 Single Li Wenchao 4 hours

This lesson introduces emotional problems, learn about young people's concepts of marriage and love, and learn how to compare them in Chinese.

UNIT REVIEW 3 (INCLUDING TESTS) 2 hours

Review the previous knowledge, students answer questions through the platform, check the learning situation, and help teachers and students analyze their learning situation.

12.Lesson 13 This is her new home 3 hours

This lesson introduces the living conditions of young people at present, and understands how to describe the living environment, learn the Chinese expression of concepts such as location and existence.

13.Lesson 14 Allen's weekend 3 hours

This lesson introduces school life, understand the sentence structure expressing complete negation, and summarize the usage of three auxiliary words "adjective", "adverb" and "should".

14.Lesson 15 Fall in love with public square dancing 4 hours

By introducing the living conditions of the elderly in China, students can learn Chinese comparative structure, enumerating relations and various usages of complements.

15.Lesson 16 Taste English afternoon tea 4 hours

This lesson introduces grammatical knowledge such as "passive" sentence and "adjective reduplication". Through the study of this lesson, students can understand the dining habits of restaurant ordering and national dishes.

UNIT REVIEW 4 (INCLUDING TESTS) 2 hours

This section is a review test class, leading students to review the knowledge points learned in the past for final tests to test students' learning effect.

<u>INSTRUCTIONAL OBJECTIVES</u>:-

Through this course, learners can systematically learn the language knowledge at this stage and cope with general communication, and can communicate on familiar topics and meet the basic communication needs of daily life and study, and gradually understand and be familiar with Chinese communication etiquette, cultural customs, etc.

Recommended Book

Tang Chinese Course- 3

MgmC-212 Understanding China

Course Code: **MgmC- 212** **T P C**
Course Name: Understanding China **2 0 2**

A course about understanding Chinese culture and introducing China's national conditions. It aims to enable international students in China to better understand China, learn Chinese language and culture, enhance understanding of different cultures, and learn about China's geographical history, philosophy, religion, political economy, etc. It covers Chinese geography and history, philosophy and religion, politics and economy, literature and art, science and technology education, medicine, and sports, etc.

Course Objectives

At the end of the course, the students are expected to be able to:

- Master the basic overview of China
- Enhance knowledge of Chinese language
- Broaden horizon
- Learn the integration and communication between different cultures

COURSE OUTLINE

COURSE CONTENTS	**Hours**
1. Geography	**4**
1.1 China from the perspective of the world	
1.2 China's natural environment	
1.3 China's mountains and rivers (1)	
1.4 China's mountains and rivers (2)	
1.5 City Highlight - Beijing	
1.6 City Highlight - Shanghai	
1.7 City Highlight - Hongkong	
1.8 Natural Landscape (1) Five Mountains, Jiuzhaigou Valley and Zhangjiajie	
1.9 Natural Landscape (2) Xinjiang	
1.10 Natural Landscape (3) Tibet	
1.11 Cultural Tour	
2. History	**8**
2.1 Chinese Ancestors	
2.2 Emperor Qin Shihuang	
2.3 Emperor Wu in Han Dynasty	
2.4 Silk Road in Western Han Dynasty	
2.5 Prosperous Period of Tang Dynasty	
2.6 Riverside Scene at Qingming Festival	
2.7 Genghis Khan and Kublai Khan	

2.8 Ming Taizu (the First Emperor of the Ming Dynasty)
2.9 The Great Voyages of Zheng He
2.10 Prosperous Period of Qing dynasty (from Kangxi to Qianlong)
2.11 Opium War
2.12 Sun Yat-sen and Kuomintang
2.13 The Communist Party of China (CPC)
2.14 Mukden Incident (9.18 Incident)
2.15 Mao Zedong and the Founding of the PRC
2.16 Diplomatic Relations of the PRC
2.17 Deng Xiaoping and Reform and Opening-up
2.18 New Era of Socialism with Chinese Characteristics

3. Philosophy **4**

3.1 The representative figure of Confucianism - Confucius
3.2 The representative figure of Confucianism - Mencius
3.3 The core concept of Confucianism - ritual
3.4 The core concept of Confucianism - benevolence and benevolent governance
3.5 The core concept of Confucianism - Taoism, reason, and knowledge acquirement by investigation
3.6 Taoism - Lao Tzu's Tao and inaction
3.7 Taoism - Chuang Tzu's equality of things and unfettered
3.8 Other schools of thought - Legalism
3.9 Other schools of thought - Military Strategist

4. Religion **4**

4.1 Folk Beliefs and Ancestor Worship
4.2 Taoism
4.3 Buddhism in China
4.4 Buddhist Doctrine, Zen, and Buddhist scenic spots
4.5 Other Religions and China's Religious Policies

5. National Governance **4**

5.1 National Flag, National Anthem, and National Emblem
5.2 Administrative divisions
5.3 National Institutions (1)
5.4 National Institutions (2)
5.5 Political Parties (1)
5.6 Political Parties (2)
5.7 Foreign policy

6. Literature and Art **4**

6.1 Stages and Genres of Chinese literature
6.2 Pre-Qin Literature
6.3 Tang Poetry
6.4 Song Ci
6.5 Four Great Classical Novels
6.6 Modern Chinese Contemporary Literature (1)
6.7 Modern Chinese Contemporary Literature (2)
6.8 Chinese Opera (1)
6.9 Chinese Opera (2)
6.10 Chinese Opera (3)
6.11 Concept of Chinese Traditional Music
6.12 Characteristics of Chinese Traditional Music and Music Appreciation

6.13 Diversified Modern Chinese Music

7. Language and Literature

7.1 Mandarin and Dialect
7.2 Ancient Chinese and Modern Chinese
7.3 Idioms
7.4 Origin and Development of Chinese Characters
7.5 Six Categories of Chinese Characters
7.6 Simplified and Traditional Chinese Characters

8. Calligraphy and Painting **4**

8.1 Definition of Calligraphy
8.2 The Evolution of Chinese Calligraphy - Bone inscriptions and bronze inscriptions
8.3 The Evolution of Chinese Calligraphy - Regular script
8.4 The Evolution of Chinese Calligraphy - Cursive script
8.5 The Evolution of Chinese Calligraphy - Running script
8.6 Calligraphy Creation and the Charm of Calligraphy
8.7 Four Treasures of the Study
8.8 Calligraphy and Other Arts
8.9 Basic Knowledge of Chinese Painting
8.10 Artistic Features of Chinese Painting
8.11 Appreciation of Three Major Themes and Representative Works of Chinese Painting

9. Economy **4**

9.1 Agriculture
9.2 Industry
9.3 Three Major Industries in China
9.4 “Internet plus” - New engine of the Chinese economy
9.5 Digital Economy 2.0
9.6 Belt and Road Initiative

10. Science and Technology **4**

10.1 Four Great Ancient Inventions
10.2 Bronze Ware
10.3 Seismograph
10.4 Ceramics
10.5 Hybrid Rice
10.6 Five-hundred-meter Aperture Spherical Radio Telescope (FAST)
10.7 China High Speed Rail
10.8 Jiaolong Manned Submersible
10.9 Supercomputer Sunway TaihuLight
10.10 Aerospace Science and Technology
10.11 Internet Payment

11. Education **4**

11.1 Imperial Examination System
11.2 Chinese Literature
11.3 China’s Examination
11.4 Teaching Chinese to Speakers of Other Languages

12. Medical and Health **4**

12.1 Medical and Health Service System in China
12.2 Traditional Chinese Medicine (TCM)
12.3 History of TCM
12.4 Core Concept of TCM
12.5 Acupuncture and Massage
12.6 TCM and Life (1)
12.7 TCM and Life (2)
12.8 Understanding Chinese Medicine
12.9 Mystery of TCM Treatment
12.10 International Communication of TCM

13. Sports and Wushu (Chinese Martial Art) **4**

13.1 Traditional Sports - Kite
13.2 Traditional Sports - Archery
13.3 Chinese Women and the Olympic Games
13.4 Taiji Boxing
13.5 Overview of Wushu Films and Dramas
13.6 Wushu Elements in Wushu Films and Dramas
13.7 Cultural Connotation of Chinese Wushu

14. Traditional Festivals and Chinese Cuisine **4**

14.1 Chinese Traditional Festivals
14.2 Chinese Traditional Festivals-The Spring Festival&The Lantern Festival
14.3 Chinese Traditional Festivals-The Dragon Boat Festivall&The Mid-Autumn 14.4 Festival
14.5 Chinese Cuisine

15. Historical and Cultural Heritage **4**

15.1 Human Civilization: “Peking Man” Site at Zhoukoudian
15.2 Dunhuang Mogao Grottoes
15.3 Great Engineering: Great Wall and Dujiangyan Irrigation System
15.4 Royal Tombs: Xiaoling Mausoleum and Imperial Tombs of the Ming and Qing Dynasties
15.5 The Largest Bronze Ware: Simuwu Great Tripod
15.6 Warring States Court Musical Instrument: Chime-Bells of Marquis Yi of the Zeng State
15.7 Types of Chinese Ancient Buildings
15.8 Royal Architecture: The Forbidden City
15.9 Ancient Residential Buildings: Quadrangles
15.10 Chinese Gardens

16. Intangible Cultural Heritage **4**

16.1. Current Status of Intangible Cultural Heritage
16.2 Gesar
16.3 Guqin
16.4 Rural Music and Dance

16.5 Shadow Play
16.6 Cantonese Opera
16.7 Chinese Seal Cutting
16.8 Nanjing Yunjin Brocade
16.9 Twenty-four Solar Terms
16.10 Crosstalk
16.11 Acrobatics
16.12. Protection of Intangible Cultural Heritage

Total Hours: 64

<u>References</u>:-

- Understanding China(Digital and Paper format), edited by Cheng Aimin, jointly developed by Peking University、Beijing Normal University、Zhejiang University、Tianjin University、Harbin Institute of Technology、Xi'an Jiaotong University、Wuhan University、Chongqing University、Shanghai International Studies University、Dalian Medical University、South China Normal University、Jiangsu Normal University and Tang International Education Group, published by Shanghai Foreign Language Education Press, recommended by China Association for International Education (CAFSA)

MgmC- 212 – Understanding China

INSTRUCTIONAL OBJECTIVES

1. Understand the basic geography of China and some famous Chinese cities
2. Understand the unique natural and cultural landscape
3. Master basic knowledge of Chinese history and important historical figures
4. Understand the basic context and major issues in the development of Chinese history
5. Understand the main schools of Chinese traditional philosophy and their representatives
6. Understand the relevant core concepts
7. Master the influence of Chinese philosophy on the mindset and lifestyle of Chinese people
8. Understand the development and spread of Taoism, Buddhism, Islamism and Christianity
9. Understand the current status and policies of religious in China
10. Master the basic knowledge in seven videos
11. Describe the main contents of China's political system in Chinese
12. Compare the similarities and differences between China's political system and home country
13. Correct and comprehensive understanding of China's political system
14. Understand knowledge related to Chinese literature
15. Understand the inheritance and absorption of Chinese contemporary music to traditional music culture
16. Experience the characteristics of Chinese language
18. Understand the language and text of China as a whole
19 Understand the evolution of Chinese calligraphy
20. Understand the basic knowledge of Chinese painting and appreciation of representative works
21. Learn knowledge and information in related fields
22. Understand the logic and reasons behind the development of China's economy
23. Understand the ancient and modern Chinese scientific and technological civilization
24. Understand the unique and long-standing Chinese education
25. Master the core concepts of harmony between man and nature, five elements of qi, yin and yang and the basic principles of health preserving in four seasons
26. 5. Familiarize with the efficacy of acupuncture and massage and the nature and function of traditional Chinese medicine
27. Understand the Chinese medical service system; Characteristics of Tibetan medicine, Mongolian

medicine, Hui medicine and Zhuang medicine

28. Understand the development history of TCM

29 International communication of traditional Chinese medicine science

30. Learn the development history of Chinese traditional sports

31. Master Chinese traditional sports such as kite and archery and their related cultural connotations

32. Understand the characteristics and advantages of modern competitive sports in China

33. Understand the spiritual connotation of Chinese Wushu

34. Understand the diet of traditional Chinese festivals

35. Understand the basic situation of Chinese historical and cultural heritage

36. Know important ancient sites and cultural relics: Peking Man Site Zhoukoudian, Dunhuang Mogao Grottoes, Great Wall, Dujiangyan Irrigation System, 37. Imperial Tombs of the Ming and Qing Dynasties, Simuwu Great Tripod, Chime-Bells of Marquis Yi of the Zeng State, etc.

38. Understand the historical and cultural value of cultural heritage

39. Master the basic situation, basic characteristics, and main types of Chinese ancient buildings

40. Familiarize with representative ancient buildings, and know important ancient sites and cultural relics: Peking Man Site Zhoukoudian, 41. Dunhuang Mogao Grottoes, Great Wall, Dujiangyan Irrigation System, Imperial Tombs of the Ming and Qing Dynasties, Simuwu Great Tripod, Chime-Bells of Marquis Yi of the Zeng State, etc.

42. Understand the historical and cultural value of ancient buildings

43. Able to distinguish different architectural and garden styles and features

44. Able to read and explain relevant key words

45. Understand the development, current situation, and protection of China's intangible cultural heritage

MATHS-233 Applied Mathematics-II

	T	P	C
Total Contact Hrs:	3	0	3

Theory: 96 Hrs.
Practical: 0

Aims & Objectives:

After completing the course the students will be able to:

Solve the problems of calculus and analytical Geometry.

Course Contents:

1. **FUNCTIONS & LIMITS.** 6 Hours
   - 1.1 Constants and variables
   - 1.2 Functions & their types
   - 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 Continuous function
   - 1.8 Problems

2. **DIFFERENTIATION.** 06 Hours
   - 2.1 Increments
   - 2.2 Geometrical interpret
   - 2.3 Differentiation ab –initio by first principle.
   - 2.4 Geometrical interpretation of differential coeff.
   - 2.5 Differentiation coefficient of X^n and $(a+b)^n$
   - 2.6 Problems.

3. **DIFFERENTIATION OF ALGEBRAIC FUNCTIONS** 9 Hours
   - 3.1 Explicit Functions
   - 3.2 Implicit Functions
   - 3.3 Parametric Forms
   - 3.4 Problems

4. **DIFFERENTIATION OF TRIGONOMETRIC FUNCTIONS** 6 Hours
   - 4.1 Differential Coefficient of Sinx, Cosx, Tanx from first principle.
   - 4.2 Differential Coefficient of Cosecx, Secx, Cotx.
   - 4.3 Differential Coefficient of Inverse Trigonometric Functions
   - 4.4 Problems

5. **DIFFERENTIATION OF LOGARITHMIC & EXPONENTIAL FUNCTION 15 Hours**
   - 5.1 Differentiation of lnx
   - 5.2 Differentiation of Log a^x

5.3 Differentiation of a^x
5.4 Differentiation of e^x
5.5 Problems

6. RATE OF CHANGE OF VARIABLES. 6 Hours
6.1 Increasing and decreasing functions
6.2 Maxima and Minima
6.3 Criteria for maximum & minimum values
6.4 Methods of finding maximum & minimum
6.5 Rate measure
6.6 Slope of a line
6.7 Velocity and acceleration
6.8 Problems

7. INTEGRATION (SIMPLE BASIC RULES) 9 Hours
7.1 Concept
7.2 Fundamental Formulae
7.3 Important Rules
7.4 Problems

8. METHODS OF INTEGRATION 9 Hours
8.1 Integration by substitution
8.2 Integration by parts
8.3 Problems

9. DEFINITE INTEGRALS. 6 Hours
9.1 Properties
9.2 Application to area
9.3 Problems.

10. DIFFERENTIAL EQUATION. 6 Hours
10.1 Introduction
10.2 Order and Degree
10.3 First Order Differential Equation of 1^{st} Degree
10.4 Solution of Problems
10.5 Problems

11. LAPLACE TRANSFORMATION. 9 Hours
11.1 Laplace Transformations
11.2 Inverse Laplace Transformations
11.3 Problems

12. FOURIER SERIES 9 Hours
12.1 Introduction
12.2 Periodic Functions
12.3 Even and Odd Functions
12.4 Problems

13. STATISTICS 6 Hours
13.1 Concept of mean, median and mode

13.2 Standard Deviation
13.3 Laws of probability
13.4 Problems

RECOMMENDED BOOKS

1. Text Book developed by TEVTA for Math-233 OR
2. Thomas Finny, Calculus and Analytic Geometry
3. Ghulam Yasin Minhas, Technical Mathematics Vol – I & II, Ilmi Kitab Khana, Lahore
4. Riaz Ali Khan, Polytechnic Mathematic Series Vol I & II, Majeed Sons, Faisalabad.
5. Sana Ullah Bhatti, Calculus and Analytic Geometry, Punjab Text Book Board, Lahore.

Course Code: **Mgm -211**	**T**	**P**	**C**
Course Title: **Business Communication**	**1**	**0**	**1**

Second course on English language focusing on business communication. It aims to develop communication skills as applied in business and commerce such as the writing and business correspondence. It covers oral communication and art of listening, interviewing, and report writing among others. It is a pure class discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the basic principles of good and effective business writing in commercial and industrial fields.
- Use the English language effectively for communication in business
- Apply knowledge and skill to write business communication with confidence and ease.
- Write legibly in handwriting and compose communication documents with correct formats.
- Appreciate the usefulness of written language

COURSE OUTLINE

Contents	**Hours**
1. Communication Process.	**6**
1.1. Purposes of communication	
1.2. Communication process	
1.3. Distortions in communication	
1.4. Consolidation of communication	
1.5. Communication flow	
1.6. Communication for self development	
2. Oral Communication Skills	**6**
2.1. Significance of Speaking	
2.2. Verbal and Non-verbal Messages	
2.3. Strategic Steps of Speaking	
2.4. Characteristics of Effective Oral Messages	
2.5. Communication Trafficking	
2.6. Oral Presentation	
3. Questioning Skills	**3**
3.1. Nature and Types of Questions	
3.2. Characteristics of a Good Questions	
3.3. Questioning Strategy	

4. Listening Skills **5**

4.1. Principles of Active Listening
4.2. Skills of Active Listening
4.3. Barriers to Listening
4.4. Reasons of Poor Listening.
4.5. Giving Feedback.

5. Interviewing Skills **3**

5.1. Significance of Interviews
5.2. Characteristics of Interviews
5.3. Activities in an Interviewing Situation
5.4. Types of Interviews.
5.5. Interviewing Strategy.

6. Report Writing **3**

6.1. Goals of Report Writing
6.2. Report Format
6.3. Types of Reports
6.4. Report Writing Strategy.

7. Reading Comprehension **2**

7.1. Reading Problems
7.2. Four Reading Skills

8. Group Communication **4**

8.1. Purposes of Conducting Meetings
8.2. Planning a Meeting
8.3. Types of Meetings
8.4. Selection of a Group for Meeting
8.5. Group Leadership Skills
8.6. Running a Successful Meeting
8.7. Active Participation Techniques

Total Hours: 32

References

- **Effective Business Communication and Report Writing**, Sh. Ata-ur-Rehman.
- **Technical Reporting**, Ulman J.N. Could JR..

Mgm 211 – Business Communication

INSTRUCTIONAL OBJECTIVES

1. **Communication Process**
   - 1.1. Understand the communication process
   - 1.2. State the benefits of two way communication
   - 1.3. Describe a model of communication process.
   - 1.4. Explain the major communication methods used in organization
   - 1.5. Identify the barriers to communication and methods of overcoming these barriers
   - 1.6. Identify misconceptions about communication

2. Oral Communication Skills
   - 2.1. Understand the process of oral communication
   - 2.2. Identify speaking situations with other peoples.
   - 2.3. Identify the strategy steps of speaking.
   - 2.4. Identify the characteristics of effective speaking.
   - 2.5. State the principles of one-way communication.
   - 2.6. State the principles of two-way communication.
   - 2.7. Identify the elements of oral presentation skills.
   - 2.8. Determine the impact of non-verbal communication on oral communication.

3. Questioning Skills
   - 3.1. Determine the uses of questioning skills and clarify information in the oral communication process
   - 3.2. Identify different types of questions.
   - 3.3. Determine the purpose of each type of question and its application.
   - 3.4. Identify the hazards to be avoided when asking questions.
   - 3.5. Demonstrate questioning skills.

4. Listening Skills
   - 4.1. Demonstrate the use of active listening skill in the oral communication process
   - 4.2. State the principles of active listening.
   - 4.3. Identify skills of active listening.
   - 4.4. Identify barriers to active listening.
   - 4.5. State the benefits of active listening.
   - 4.6. Demonstrate listening skills.
   - 4.7. Explain the importance of giving and receiving feed back.

5. Interview Skills
   - 5.1. Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.
   - 5.2. State the significance of interviews.
   - 5.3. State the characteristics of interviews.
   - 5.4. Explain the activities in an interviewing situation.
   - 5.5. Describe the types of interviews
   - 5.6. Explain the interviewing strategy

5.7. Prepare instrument for a structured interview

6. Report Writing

6.1. Prepare a report out-line, based on subject matter and audience
6.2. Identify the different types of reports
6.3. Determine when to use an informal or formal report presentation
6.4. Identify the stages of planning a report
6.5. Identify the parts of a report and choose the parts appropriate for each type of report
6.6. Draft a report outline

7. Reading Comprehension

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

8. Group Communication

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

Course Code: **CIT 212**	**T**	**P**	**C**
Course Title: Object Oriented Programming with JAVA	**1**	**3**	**2**

This course will give you basic understanding of Java programming language and object oriented programming principles. It intends to provide students with working skills and knowledge in writing programs using the java programming language. The course covers how to download and install Eclipse / NetBeans IDE, Object and classes, implement object oriented principles, generics and exception handling.

Course Objectives

At the end of the course the students are expected to be able to

- Explain the core part of java programming language
- Explain the Object Oriented Programming principles
- Formulate logically the problems and their solutions
- Apply Java programming language to solve problems

COURSE OUTLINE

Contents	**Hours**
1. Introduction to Java	**2**
1.1. Java Virtual Machine	
1.2. Java Development Kit	
1.3. Java Runtime Environment	
1.4. Integrated Development Environment	
2. Variable and Operators	**2**
2.1. Understanding Variable	
2.2. Variable Types and Scope	
2.3. Operators	
2.4. Boxing and Unboxing	
3. Classes and Objects	**6**
3.1. What is a Class	
3.2. What is an Object	
3.3. Methods	
3.4. Constructors	
3.5. Access Modifier	
4. Control Statements	**4**
4.1. Introduction and Control Statement Types	

4.2. Conditional Statements
4.3. Loops
4.4. Break / Continue

5. Object Oriented Programming **8**
5.1. Inheritance
5.2. Polymorphism
5.3. Encapsulation

6. Interfaces **4**
6.1. Introduction
6.2. Defining and Implementing Interfaces
6.3. Advantages of using Interface

7. Generics **4**
7.1. What is Generic
7.2. Generic Class
7.3. Generic Method

8. Exception Handling **2**
8.1. Exceptions
8.2. Try and Catch
8.3. Finally

Total Hours: 32

References

- **Java in a Nutshell (**6th Edition) by Benjamin J. Evans and David Flanagan
- **O'Reilly Java 8 Pocket Guide** by Robert Liguori and Patricia Liguori

CIT 212 – Object Oriented Programming with JAVA

LIST OF PRACTICALS

1. Installation of JDK
2. Installation of NetBean and Eclipse
3. Setup environment variable and Classpath
4. Program to Check Student is Pass or Fail
5. PIN Code Verification
6. Printing of Weekdays based on switch-case
7. Check whether a Character is ‘Alphabet’, ‘Digit’ or a ‘Special Character’
8. Find the largest value in an Array
9. Printing series of natural numbers, even and odd numbers (GUI)
10. Check for Prime Number
11. A number guessing game
12. Basic Calculator
13. Changing Text Case from lower to upper and upper to lower
14. Reverse of a String
15. Creating a Java Class for Student Records to demonstrate classes, objects and Inheritance

CIT 212 – Object Oriented Programming with JAVA

INSTRUCTIONAL OBJECTIVES

1. Introduction to Java

1.1. Describe Java Virtual Machine
1.2. Describe Java Development Kit
1.3. Install NetBeans / Eclipse
1.4. Setup Environment Variable
1.5. Explain Java Program Structure
1.6. Explain Lifecycle of Java Program

2. Variable and Operators

2.1. Create Instance of a Variable
2.2. Use Preemptive data types
2.3. Apply Arithmetic Operators
2.4. Use Increment and Decrement Operators
2.5. Apply Comparison Operators
2.6. Apply Boolean Operators
2.7. Explain Boxing and Unboxing Conversions

3. Control Statements

3.1. Explain Control Statement Types
3.2. Describe Expression Statements
3.3. Explain Compound Statements
3.4. Apply If/Else statements
3.5. Apply Switch Statement
3.6. Use Loops (DO, WHILE, FOR, FOREACH)
3.7. Apply BREAK / CONTINUE statements

4. Classes and Objects

4.1. Define a Classes
4.2. Create an Object
4.3. Use an Object
4.4. Use Lambda Expression
4.5. Create a Class Property and Method
4.6. Create and Initializing Objects
4.7. Define Constructor
4.8. Use Constructors for classes
4.9. Pass Information to Methods and Constructors
4.10. Return Value from a Method
4.11. Control Access to a Member of a Class

5. Object Oriented Programming

5.1. Explain Subclass and Inheritance
5.2. Extend a Class
5.3. Override Superclass Methods
5.4. Invoke an overridden method
5.5. Hide Data and Encapsulation
5.6. Access control and Inheritance
5.7. Use Abstract Classes and Abstract Methods

6. Interfaces

6.1. Defining an Interface
6.2. Extend Interfaces
6.3. Implement an Interface
6.4. Implement multiple interface
6.5. Differentiate between Interface and Abstract Class

7. Generics

7.1. Define the term ‘Generic’
7.2. Describe Generic Types and Parameters
7.3. Describe Generic Classes and Interfaces
7.4. Use Constructors with Generics
7.5. Apply Generic Method

8. Exception Handling

8.1. Explain Exceptions
8.2. Throw Exceptions
8.3. Use Multi Catch Exception
8.4. Use Handling and Catching Exceptions
8.5. Print Information about Exceptions

Course Code:	**CIT -223**	**T**	**P**	**C**
Course Title:	**Computer Networks**	**2**	**3**	**3**

Introductory course on data communication and computer networks. It aims to provide the students conceptual tools to understand the design and implementation of data communication as applied to computer networks. It discusses the layered model. It covers communication, media, WAN, LAN, Internetworking, protocols, network management and troubleshooting. This comes with practical component to complement classroom discussion.

Course Objectives

At the end of the course, the students are expected to be able to

- Understand basic concepts and principles of data communication as applied to computer networking
- Synthesize the different approaches of data communication in networking and assess their effectiveness in implementation
- Troubleshoot and diagnose network faults and correct them
- Assemble cabling system of a network
- Recognize the inherent problems in networking and appreciate the solutions of the problems

COURSE OUTLINE

Contents	**Hours**
1. Principles of Data Communication and Networking	***8***
1.1. Development of Communication and Data Communication	
1.2. Overview of OSI and TCP/IP model	
1.3. Data Transmission	
1.3.1. Analog Transmission	
1.3.2. Digital Transmission	
1.3.3. Signal Impairment	
1.4. Transmission Media	
1.4.1. Types of Cables and Connectors	
1.4.2. Telephony and Wireless Communication	
2. Data Link Control	**4**
2.1. Addressing scheme (Mac addresses)	
2.2. Error detection and correction	
3. Multiplexing	**4**
3.1. Frequency-Division Multiplexing	
3.2. Time-Division Multiplexing	
4. Local Area Network (LAN)	**12**
4.1. LAN Architecture	
4.2. Topologies	
4.3. LAN Systems	
4.3.1. Ethernet and Fast Ethernet (CSMA/CD)	
4.3.2. Token Ring and FDDI	

5. Connectivity Devices **4**

5.1. Modems
5.2. Hubs and Repeaters
5.3. Bridges, Routers and Gateways

6. Internetworking **20**

6.1. Principles of Internetworking
6.2. Protocols
6.2.1.OSI Model
6.2.2.TCP/IP Suite
6.3. Internet Protocol (IP) and
6.4. Addressing scheme at NW layer (IP address classes)
6.5. Routing Protocol
6.6. Transport Protocols and Transport Services
6.7. Addressing scheme at Transport layer (Port addresses)
6.8. Application Layer protocols
6.9. Addressing scheme at Application layer (DNS)

7. Network Administration and Management **8**

7.1. Types of Servers
7.2. Managing Accounts
7.3. Performance Monitoring

8. Network Troubleshooting **4**

8.1. Structured Cabling
8.2. Network Testing Tools
8.3. Fault Diagnosis: Troubleshooting Connectivity and Communication

Total Hours: 64

References

- **Networking Essentials**, Joe Casad and Dan Newland, Techmedia
- **Computer Networks, 2Ed**, Andrew S. Tanenbaum, Prentice Hall
- **Data and Computer Communications, 4Ed**., William Stallings, MacMillan
- **Local Area Networks**, 2Ed, Peter Hodos
- **An introduction to Local Area Networks**, Greg Nunemacher
- **Networking Explained**, Gallo
- **Networking Essentials**, **2Ed**, Microsoft Press

CIT 223 – Computer Networks

LIST OF PRACTICALS

1. Identifying various hardware components of a network
2. Studying network card
3. Splicing a coaxial cable
4. Terminating twisted pair cable
5. Terminating coaxial cable
6. Using Cable Testers
7. Configuring Mac address on Windows / Linux OS
8. Configuring IP addresses on Windows / Linux OS
9. Design of a Local Area NW of computers
10. Troubleshooting NW connectivity.
11. Installing and configuring a NW printer
12. Using Network Tools and Analyzers
13. Using Network Monitors

CIT 223 – Computer Networks

INSTRUCTIONAL OBJECTIVES

1. Principles of Data Communication and Networking

1.1. Discuss the development of communication
1.2. State the principles of data communication
1.3. Describe methods of data transmission
1.4. Differentiate analog signal from digital signal
1.5. Explain causes of transmission error
1.6. List transmission media
1.7. Describe each transmission media
1.8. State the advantage and disadvantage of each transmission media

2. Data Link Control

2.1. Protocols at data link layer
2.2. Understand importance of Mac address
2.3. Describe methods of error detection and correction

3. ***Multiplexing***

3.1. Explain the need for multiplexing
3.2. Describe Frequency-division multiplexing
3.3. Describe Synchronous Time-division Multiplexing

4. Local Area Network (LAN)

4.1. Describe LAN architecture
4.2. Identify different topologies of LAN
4.3. Describe different topologies of LAN
4.4. Illustrate different topologies
4.5. State the advantage and disadvantages of each topology
4.6. Describe different LAN systems like Ethernet
4.7. Explain the advantage and disadvantage of different LAN systems
4.8. Describe bridges

5. Connectivity Devices

5.1. Explain the need for connectivity devices
5.2. State the operational principle of Modems
5.3. Describe Modem
5.4. Describe hubs and repeaters
5.5. Describe bridges, routers and gateways
5.6. Illustrate the relationships of this devices in networking

6. Internetworking

6.1. Explain the principles in Internetworking
6.2. Explain the need for protocols in Internetworking
6.3. Describe each layer of OSI model of network
6.4. Differentiate connectionless and connection-oriented internetworking
6.5. Describe the Internet Protocol
6.6. Discuss the development of Internet Protocol
6.7. Describe routing protocols

6.8. Explain transport protocol
6.9. Describe Transmission Control Protocol (TCP)
6.10. Explain the advantage of TCP/IP from OSI

7. Network Administration and Management

7.1. Describe different types of servers
7.2. Create and manage user accounts
7.3. Use software to conduct performance monitoring of network
7.4. Explain the data protection and security
7.5. Describe means to protect data and secure its integrity in network system.

8. Network Troubleshooting

8.1. Describe structured cabling
8.2. Identify network testing tools
8.3. Use network testing tools to diagnose network fault
8.4. Perform network fault diagnoses
8.5. Troubleshoot network connectivity and communication faults

Course Code: ***CIT 235***	***T***	***P***	***C***
Course Title: **Microprocessor Architecture**	**3**	**6**	**5**

The core course on computer hardware dealing with the main components of personal computers. It intends to provide students with working knowledge of how the central processing unit (CPU) of microcomputers, the Intel microprocessor, operates and its instruction set. It discusses organization of computer, study of Intel 8088/8086 family of microprocessor, its instruction set and programming, interfacing and support devices. It comes with laboratory component to reinforce the theoretical classroom discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the concepts and design, organization and operational principles of microprocessor especially, Intel 8088/86 microprocessor.
- Use the instruction set of Intel 8088/86 to write assembly language program.
- Create hardware interface for Intel 8088/86 microprocessor
- Explain system timing and bus multiplexing
- Write amply documented and readable assembly program
- Appreciate the logic and simplicity of the organization of microprocessors

COURSE OUTLINE

Contents	**Hours**
(Part-A)	
1. Fundamental Concepts	**5**
1.1. Historical background of microprocessor	
1.1.1 Evaluation of different processors	
1.2. Processor based personal computer	
1.3. Bus based microprocessor	
1.3.1 Address, Data and Control Buses	
1.4. Fundamental Control Bus	
1.5. Tristate Devices in Bus-based Systems	
1.6. Definition of Terms	
1.7. Microcomputer Block Diagram.	
1.8. Memory Devices	
1.9. I/O ports.	
1.10. Basic Operation of microprocessor	
1.11. Roles of Addressing and Control Signals	
2. Introduction to Intel 8088/86 Microprocessor And Architecture	**5**
2.1. Define basic terms	

2.2. Block Diagram of Intel 8088/86 Microprocessor
2.3 Programming model of 8086/8088
2.2.1 Function and working of each part of programming model
2.3 Real mode memory addressing
2.4 Protected mode memory addressing
2.5 Memory Paging

3- Hardware specifications of 8086/8088 **06**

3.1 Functional Pin Definitions for the 8088/86
3.2 Clock generator (8284A)
3.3 Power and Clocking Requirements of 8088/86
3.4 Bus buffering and latching
3.4.1 Bus Multiplexing and De-Multiplexing.
3.4.2 Buffered system
3.5 Bus Timing
3.5.1 Read Timing and Write Timing
3.6 READY and WAIT state
3.7 Minimum Mode and Maximum Mode

4. Addressing Modes **10**

4.1 Data Addressing Modes
4.2 Register Addressing Modes
4.3 Immediate Addressing Modes
4.4 Direct Addressing Modes
4.5 Base-Plus-Index Addressing
4.6 Register Relative Addressing
4.7 Base Relative-Plus-Index Addressing
4.8 Program Memory addressing Modes
4.9 Stack Memory-Addressing Modes

5. Instruction set of 8086/88 **22**

5.1 Move instruction
5.2 Push/ POP instruction
5.3 Load effective address LEA
5.4 String data transfer
5.4 Arithmetic Group
5.5 BCD and ASCII arithmetic's.
5.6 Logical Group
5.7 Programming control instructions
5.8 Controlling the flow of program
5.9 Procedure
5.10 CALL, RETURN

(Part-B)

6**. Intel 8088/86 System Timing and Bus Multiplexing** **12**

6.1 Definition of terms
6.2 8088/86 Machine Cycles
6.3 Timing Diagram for Common 8088/86 Instructions.
6.4 Purpose and implementation of the 8088/86 Wait, Halt and Hold states.

7- Interfacing to Intel 8088/86 **20**

7.1 Define and explain the different terms of interfacing
7.2 Absolute Address and Linear Address Decoding
7.3 8- bit memory interface
7.4 16-bit memory interface
7.5 Basic I/O interface
7.6 Priority Interrupt control unit in 8086/88 based system
7.7 Programmable Peripheral Interface (PPI)
7.8 Programmable interval timer (8254)
7.8 Direct Memory Access (DMA)

8- INTERUPTS **08**

8.1 Basic interrupt processing
8.2 Purpose of Interrupts.
8.4 Interrupt Instructions (BOUND, INTO, INT.INT-3, IRET)
8.4 Operation of Interrupt Flag
8.5 Programmable interrupt controller

9- 8-Bit Support Devices **08**

9.1 8088/86 Support device
9.2 General Purpose Support device
9.3 Programmable Support Device
9.4 Operation and Programming of Intel 8255 Programmable Peripheral Interface.
9.5 Function of Intel 8-bit Support Devices

Total Hours: 96

References

- The 8086/8088 microprocessor Barry B.Brey
- The 80x86 Family, Design, Programming and Interfacing, John Uffenbach
- MCS-88/86 User's Manual, Intel Corporation
- Microprocessor Architecture, Programming and Applications with the 8088/86/8080A, Ramesh, S. Gaonkar, MacMillan
- Intel Microprocessors: Hardware, Software, and Applications, Roy W. Goody, McGraw Hill

CIT 235 – Microprocessor Architecture

LIST OF PRACTICAL

1. Introduction to Flowcharting
2. Algorithm Design Using Flowcharts
3. Applications of ASCII Code.
4. Introduction what is Assembly Language?
    - Advantages of Assembly Language
    - Basic Features of PC Hardware
    - Binary Number System
    - Hexadecimal Number System
    - Binary Arithmetic
5. Familiarize environment setup
    - Local Environment Setup
    - Installing NASM/MASAM
6. Entry and Disassembly of Simple Programs.
    - Using Arithmetic Instructions e.g. ADD, SUB, MUL, DIV, etc
    - Using Logical instruction Instructions e.g. OR, AND NOT, etc.
7. Using Trainer and Instructions of Assembly language Control Traffic Light
8. Program BCD to Binary Conversion
9. Familiarize with the 8088/86 System Timing.
10. Interface Isolated Output Ports
    - Interfacing Keyboard, Mouse, Printer and scanner.

9- Using Microprocessor Trainer and Assembly Language Instructions develop following sensors

- Temperature
- Smoke

10- Use 8255A Programmable Peripheral Interface

11- Use 8155 Static RAM with I/O Ports and Timer.

12- Use 8755 EPROM with I/O Ports

Instructional Objectives

1- Fundamental Concepts

1.1- Describe Historical background of microprocessor
- 1.1.1 Describe the Evaluation of different processors
- 1.1.2 Compression between different processors

1.2 Describe Processor based personal computer

1.3 Describe Bus based microprocessor
- 1.3.1 Describe and defined Address, Data and Control Buses
- 1.3.2 Describe the functionality of Address, Data and Control Buses

1.4 Describe fundamental Control Bus

1.5 Describe and define the use of Tristate Devices in Bus-based Systems

1.6 Define the different basic terms as such
- 1.6.1 ALU, Microprocessor, Microcomputer
- 1.6.2 Storage , Input and Output Ports , Input /output Devices
- 1.6.3 Software Programs, Hardware,
- 1.6.4 Address decoding and microcontrollers,
- 1.6.5 Number system, Types of different number systems
- 1.6.6 Conversion of binary, octal and hexadecimal numbers, Data Formats.

1.7 Sketch and explain the Microcomputer Block Diagram.

1.8 Describe the basic purpose and types of memory devices

1.9 Describe the basic purpose and types of I/O ports

1.10 Describe Basic Operation of microprocessor
- 1.10.1 How instruction fetch and execute
- 1.10.2 Define and describe memory read cycle
- 1.10.3 Define and describe memory write cycle
- 1.10.4 Define and describe I/O read cycle
- 1.10.5 Define and describe I/O write cycle

1.11 Describe Roles of Addressing and Control Signals

2. Introduction to Intel 8088/86 Microprocessor And Architecture

2.1 Define and describe the basic terms
- 2.1.1 Register Array
- 2.1.2 General purpose registers
- 2.1.3 Temporary registers
- 2.1.4 Internal data bus
- 2.1.5 External data bus
- 2.1.6 Instruction decoder
- 2.1.7 Accumulator
- 2.1.8 Condition flags
- 2.1.9 Addressing Registers
- 2.1.10 programing counters

2.2 Sketch and Label Block Diagram of Intel 8088/86 Microprocessor
- 2.2.1 Explain Functions of each block of 8086/88 Microprocessor

2.3 sketch and label Programming model of 8086/8088
- 2.2.1 Explain Function and working of each part of programming model

2.4 Explain Real mode memory addressing

2.5 Explain protected mode memory addressing

2.6 Explain Memory Paging

3- Hardware specifications of 8086/8088

3.1 Functional Pin Definitions for the 8088/86
- 3.1.1 Draw the pin diagram of 8086/8088
- 3.1.2 Explain the function of each pin
- 3.1.3 Define and explain Minimum mode operation of 8086/88
- 3.1.4 Define and explain Minimum mode operation of 8086/88

3.2 Clock generator (8284A)
- 3.2.1 Sketch the pin diagram of Clock generator (8284A)
- 3.2.2 Explain the function of Clock generator (8284A)

3.3 Describe the Power and Clocking Requirements of 8088/86

3.4 Describe Bus buffering and latching in 8086/88
- 3.4.1 Why we need bus buffering and latching in microprocessor
- 3.4.2 Explain 8086/88 data bus multiplexing
- 3.4.3 Explain and show how data bus demultiplexed to create (16-bit) address and(8-bit) data bus
- 3.4.4 Explain how control signals MEMR,MEMW and I/ OW can be produced from the 8086/88
  IO/M, RD and, WR/ control signals

3.5 Explain Bus Timing
- 3.5.1 Explain why we need to know the different Bus Timings for 8086/88
- 3.5.2 Sketch and explain the read timing diagram for 8086/8088
- 3.5.3 Sketch and explain the write timing diagram for 8086/8088

3.6 Explain READY and WAIT state

3.7 Minimum Mode and Maximum Mode
- 3.7.1 Operation of each mode

4. Addressing Modes

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4.1 Describe Data Addressing Modes
- 4.1.1 Use the data-addressing modes to form assembly language statements.
- 4.1.2 Explain the operation of data addressing mode

4.2 Register Addressing Modes
- 4.2.1 Use the Register addressing modes to form assembly language statements.
- 4.2.2 Explain the operation of Register addressing mode

4.3 Explain the operation of Immediate Addressing Modes

4.4 Explain the operation of Direct Addressing Modes

4.5 Explain the operation of Base-Plus-Index Addressing

4.6 Explain the operation of Register Relative Addressing

4.7 Explain the operation of Base Relative-Plus-Index Addressing

4.8 Explain the operation of Program Memory addressing Modes

4.9 Explain the operation of Stack Memory-Addressing Modes

4.9.1 Describe the sequence of events that place data onto the stack or remove data from the stack.

4.9.2 Detail the difference between addressing memory data using real mode and Protected mode operation

5. Instruction set of 8086/88

5.1 Define and explain the format of Move instruction

5.3 Define and explain Push/ POP instruction

5.4 Define and explain Load effective address LEA

5.5 Define and explain String data transfer

5.6 Define and explain Arithmetic Group

5.6.1 Addition, Subtraction, Comparison, Multiplication, Division

5.7 Describe BCD and ASCII arithmetic's.

5.8 Define and explain Arithmetic Group Logical Group

5.8.1 AND, OR TEST, Bit TEST, NOT and NEG

5.9 Define and explain Arithmetic Group Shift and Rotate instructions

5.10 Define and explain Arithmetic Group Programming control instructions

5.10.1 JUMP (Conditional and Unconditional)

5.11 Define and explain Arithmetic Group Controlling the flow of program

5.11.1 While Loop, DO-While Loop

5.12 Define and explain Arithmetic Group Procedure

5.12.1 CALL, RETURN

6. Intel 8088/86 System Timing and Bus Multiplexing

6.1 Definition of the following terms

6.1.1 T-State, Machine Cycle and Instruction Cycle Bus Cycle

6.1.2 Opcode fetch, Memory read cycle, Memory write cycle, I/O Read cycle, and I/O Write cycle

6.2 Describe 8088/86 Machine Cycles

6.2.1 Explain how 8086 instruction decode

6.2.1 Explain how machine cycle encode for the required instruction cycle

6.3 Interpret Timing Diagram for Common 8088/86 Instructions.

6.4 describe the purpose and implementation of the 8088/86 Wait, Halt and Hold states.

7. Interfacing to Intel 8088/86

7.1 Define and explain the different terms of interfacing

7.1.1 Isolated I/O and Memory Mapped I/O

7.1.2 Unconditional I/O, Unconditional and Polled I/O

7.1.3 Describe Interrupt Service Routine and Interrupt Vector

7.1.4 Describe Service Request Flag

7.1.5 Describe Strobed Port

7.2 Explain Absolute Address and Linear Address Decoding

7.3 Describe 8- bit memory interface

7.4 Describe 16-bit memory interface

7.5 Describe Basic I/O interface

7.6 Describe Priority Interrupt control unit in 8086/88 based system

7.7 Explain Programmable Peripheral Interface (PPI)

7.8 Explain Programmable interval timer (8254)

8- INTERRUPTS

8.1 Define and describe Basic interrupt processing
8.2 Describe Purpose of Interrupts.
8.4 Define and explain Interrupt Instructions (BOUND, INTO, INT.INT-3, IRET)
8.5 Define and explain the Operation of Interrupt Flag
8.6 Describe Programmable interrupt controller

9- 8-Bit Support Devices

9.1 Describe 8088/86 Support device
9.2 Describe General Purpose Support device
9.3 Describe Programmable Support Device
9.4 Explain the Operation and Programming of Intel 8255 Programmable Peripheral Interface.
9.5 Explain the Function of Intel 8-bit Support Devices

Course Code: IOT-212	T	P	C
Course Title: **SCM Application Technology (Single Chip Microcomputer)**	**1**	**3**	**2**

This course is a professional course of Internet of Things application technology, which is mainly integrates MCS-51 MCU hardware circuit connection and C language programming into microcontroller electronic products projects, and cultivates highly skilled talents with design, analysis, debugging and production capabilities of microcontroller application products for intelligent electronic products production and development enterprises. It plays an important role in the cultivation of students' vocational ability and professional quality.

Course Objectives

At the end of the course the students are expected to be able to

- Familiar with the basic structure and working principle of MCS-51 microcontroller;
- Learn software and hardware design methods and steps of MCS-51 microcontroller development system;
- Learn how to use proteus simulation software;
- Capable of designing, making and debugging MCS-51 microcontroller typical application system;
- Capable of self-learning of other types of microprocessors;
- Have the learning attitude and ideology of active participation, active enterprising, advocating science and self-innovation;
- Have good teamwork spirit, innovation ability and professional quality

COURSE OUTLINE

Contents	***Hours***
1. Project 1: Theme signal lamp design	**16**
1.1. Task 1: Light up LED	
1.2. Task 2: Design of water lamp control system	
1.3. Task 3: Design of breathing lamp control system.	
2. Project 2: Electronic clock system design	**16**
2.1. Task 1: Design of timing system design;	
2.2. Task 2: Design of display system.	
Total Hours:	***32***

References

- **Fundamentals and Applications of Single Chip Microcomputer (C Language version)**, Jingxia Wang, Higher Education Press

- **51 MCU project tutorial (C language version)**, Xianfeng Wu, Posts and Telecommunications Press

LIST OF PRACTICAL

1. Simulation tool: Proteus
2. Installing keil and Proteus
3. Use of keil and Proteus
4. Identify common electronic devices in Proteus
5. Programming Task : Light up LED
6. Programming Task : Design of water lamp control system
7. Programming Task : Design of breathing lamp control system
8. Programming Task : Design of timing system design
9. Programming Task : Design of display system

INSTRUCTIONAL OBJECTIVES

1. Project 1: Theme signal lamp design

1.1. Understand the definition, characteristics and development history of single chip microcomputer
1.2. Understand the internal structure (CPU, Oscillating clock circuit, Reset circuit, timer/Counter, Interrupt system, Serial port, Parallel port, ROM, RAM, SFR) of the single chip microcomputer
1.3. Master the principle of man-machine dialogue
1.4. Master the LED luminous principle
1.5. Master the lighting LED project design process
1.6. Master the logic operation principle
1.7. Master the principle of bit operation
1.8. Understanding LED register
1.9. Master Register configuration "four-step Method"
1.10. Understand the concept of duty cycle
1.11. Understand PWM concepts and features
1.12. Master the concept and implementation principle of breathing lamp
1.13. Master breathing lamp design ideas

2. Project 2: Electronic clock system design

2.1. Understand the application of timer;
2.2. Master the structure of the timer;
2.3. Master the working principle of timer
2.4. Master the design principle of timing system
2.5. Understand LED dot matrix display
2.6. Understand dot matrix display features
2.7. Master the principle of dot matrix display
2.8. Master task design process of LED dot matrix display system

Course Code: **CIT- 244**	**T**	**P**	**C**
Course Title: **Electronics – II**	**3**	**3**	**4**

A major course in Computer Information Technology dealing with the electronics devices and circuits. It intends to complement the student's foundation knowledge of electronics. It covers diodes, transistors, amplification, power electronics and troubleshooting of analogue electronic devices. It intends to provide students with knowledge and skills to analyze digital circuits. It contains discussion on binary numbers, Boolean algebra, different digital IC families, flip-flop and latches, clock and triggers, registers, counters, and arithmetic circuits. This has laboratory component to strengthen the classroom theory.
This comes with a laboratory course.

Course Objectives

At the end of the course the students are expected to be able to

- Understand basic concepts, principles and application of analogue electronics
- Apply operational principles of transistors for amplification.
- Use knowledge of electronics to maintain electronic devices
- Relate analogue electronics to digital electronics
- Observe and measure accurately using electrical and electronics instruments
- Demonstrate motivation in applying knowledge and skills in analogue electronics in daily life
- Understand the mathematical and logical foundations of digital circuit operational principles.
- Relate binary mathematics and boolean logic with digital circuit constructs
- Understand the construction, operation and use of different digital circuits (IC's)
- Apply digital circuit principles in building clocked and trigger circuits
- Calibrate, manipulate and use measuring instruments accurately and with ease
- Appreciate the relationship between the concepts of binary numbers, Boolean algebra and digital circuits

COURSE OUTLINE

Contents	**Hours**

COURSE CONTENTS.

(Part-A)

1. BOOLEAN ALGEBRA. (06 Hours)

- 1.1 Boolean Expressions.
  - 1.1.1 Boolean Expressions and Truth Tables.
  - 1.1.2 Minterm Expressions, Sum of Products
  - 1.1.3 Maxterm Expressions, Product of Sums.
  - 1.1.4 Un-simplified Boolean Expression and Schematic Circuits
- 1.2 Logic Simplifications.
  - 1.2.1 Boolean Simplification.
  - 1.2.2 DeMorgan's Theorems.

1.2.3 Karnaugh Mapping

2. BINARY ARITHMETIC CIRCUITS. (07 Hours)

2.1 Binary Addition
- 2.1.1 Half Adder Design
- 2.1.2 Full Adder Design
- 2.1.3 N bit Binary Adder Circuit

2.2 Binary Arithmetic functions with complements
- 2.2.1 2's and 1's Complement Notation, Addition and Subtraction.
- 2.2.2 Binary Subtractor Circuit
- 2.2.3 Binary Adder/ Subtractor Circuit.

3. COMBINATIONAL CIRCUIT DESIGN. (12 Hours)

3.1 Paradigm for Combinational Logic Problems.
- 3.1.1 Word Problem.
- 3.1.2 Construct Truth Table
- 3.1.3 Create a Logic Equation from a Truth Table
- 3.1.4 Simplify the logic Equation
- 3.1.5 Development of Combinational Logic Circuit

3.2 Specific Application MSI Gates
- 3.2.1 Level of Integration (SSI, MSI, LSI)
- 3.2.2 Display Drivers
- 3.2.3 Code Converters
  - 3.2.3.1 BCD to Decimal
  - 3.2.3.2 Decimal to BCD
  - 3.2.3.3 Binary to Hexadecimal
  - 3.2.3.4 BCD to seven segment decoder.
- 3.2.4 Decoding Circuits
- 3.2.5 Multiplexing Circuits
- 3.2.6 Demultiplexing Circuits

4. SEQUENTIAL CIRCUITS. (10 Hours)

4.1 Introduction to Sequential Logic.
- 4.1.1 Latches
- 4.1.2 RS Flip Flop
- 4.1.3 Clocked RS Flip Flop

4.2 JK Flip Flop
- 4.2.1 Operation of JK Flip Flop
- 4.2.2 Asynchronous Inputs
- 4.2.3 Synchronous Inputs

4.3 Triggers
- 4.3.1 Positive-Edge Trigger
- 4.3.2 Negative-Edge Trigger
- 4.3.3 Positive-Level Trigger (Latch)
- 4.3.4 Negative-Level Trigger (Latch)

4.4 Other Flip Flops
- 4.4.1 Master Slave Flip Flop
- 4.4.2 D type Flip Flop

4.4.3 T type Flip Flop

4.5 Multivibrators.

4.5.1 555 Timer

4.5.2 555 Timer as Monostable Multivibrator (One Shot)

4.5.3 555 Timer as Astable Multivibrator (Free Running)

5. SHIFT REGISTERS AND COUNTERS. (8 Hours)

5.1 Shift Register

5.1.1 Function of Shift register

5.1.2 Types of Shift register

5.1.3 Integrated Shift register

5.2 Asynchronous Counters.

5.2.1 Discrete Ripple Counter

5.2.2 Discrete Modulus- N Ripple Counter

5.2.3 Integrated Ripple Counter (7493)

5.3 Synchronous Counter.

5.3.1 Discrete Up Counter.

5.3.2 Discrete Down Counter.

5.3.3 Discrete Modulus-Synchronous Counter.

6. FAMILIES AND SPECIFICATIONS (05 Hours)

6.1 Introduction of different Logic Families

6.1.1 RTL

6.1.2 DTL

6.1.3 ECL

6.1.4 TTL

6.1.5 IIL

6.1.6 MOS

6.1.7 CMOS

6.1.8 Interfacing Different Logic Families.

6.2 Specification Sheets

6.2.1 Electronic Sites

6.2.2 Voltage Levels

6.2.3 Current Levels

6.2.4 Fan-out, Fan-in

6.2.5 Switching Characteristics- Propagation Delay, Noise Margin, Power dissipation.

(Part-B)

7. Interfacing with Analog World (07 Hours)

7.1 Digital to Analog Conversion.

7.1.1 Introduction and needs

7.1.2 Binary weighted DAC

7.1.3 Ladder type DAC

7.2 Analog to Digital Conversion.

7.2.1 Introduction and needs ADC

7.2.2 Simultaneous ADC

7.2.3 Counter Type ADC

7.2.4 Dual Slope ADC

7.2.5 Successive Approximation ADC

8. Memory (06 Hours)

8.1 Memory Technology

8.2 General Memory Operation.
8.3 Memory Considerations
8.4 Types of Memories
8.4.1 ROM
8.4.2 RAM
8.4.3 SRAM
8.4.4 DRAM
8.4.5 PLDs.
8.4.6 Magnetic and Optical Memories

9. BIPOLAR JUNCTION & FIELD EFFECT TRANSISTORS (16 Hours)

9.1 Transistor types and BJT construction
9.2 Basic Transistor operation, Forward, Reverse Bias. Transistor current.
9.3 Transistor Parameters and Ratings
9.4 Transistor as a voltage amplifier.
9.5 Transistor amplifier configuration, comparison and uses.
9.6 Transistor, modes of operation.
9.7 Transistor as a switch.
9.8 Transistor Clipper
9.9 Field Effect Transistor and its Biasing:
9.9.1 Junction Field Effect Transistor (JFET).
9.9.2 JFET Characteristics and parameter.
9.9.3 JFET Biasing.
9.9.4 Metal oxide Semiconductor FET (MOSFET) types.
9.9.5 MOSFET Biasing.

10. SPECIAL DEVICES. (18 Hours)

10.1 Zener Diodes.
10.1.1 Zener Diode as voltage Regulator, percentage of regulation.
10.1.2 Zanier limiting.
10.2 Optical Diodes
10.2.1 Light Emitting Diode (LED)
10.2.2 Liquid crystal Diode (LCD)
10.2.3 Photo diode.
10.3 Other Diodes.
10.3.1 Tunnel Diode, Negative resistance region.
10.3.2 Tunnel Diode Oscillator.
10.3.3 LASER Diode.
10.4 Silicon Controlled Rectifier (SCR)
10.5 Simple SCR Applications.
10.6 Diac and Triac
10.7 Unijunction Transistor (UJT)
10.8 Photo diode & Photo transistor
10.9 Light Activated SCR (LASCR)
10.10 Opto-coupler.

TEXT / REFERENCE BOOKS:

1. TL Floyd “Electronics Devices” 8th ed. Prentice Hall, ISBN 0131140809
2. Floyd "Digital Fundamentals"
3. Introductory Electronic Devices & Circuits 4th Edition by Robert T. Paynter
4. Introduction to Integrated Circuits by Victor H. Grinich ,national Book foundation Islamabad
5. Digital Design, 5th edition, Morris Mano and Michael D. Cilette, Pearson, 2011.

INSTRUCTIONAL OBJECTIVES.

1. BOOLEAN ALGEBRA.

1.1 Use Boolean Expressions.
- 1.1.1 Use Boolean Expressions and Truth Tables.
- 1.1.2 Use Minterm Expressions, Sum of Products
- 1.1.3 Use Maxterm Expressions, Product of Sums.
- 1.1.4 Describe Un-simplified Boolean Expression & develop Schematic Circuits

1.2 Apply Logic Simplifications.
- 1.2.1 Use Boolean Simplification.
- 1.2.2 Use DeMorgan's Theorems.
- 1.2.3 Use Karnaugh Mapping

2. BINARY ARITHMETIC CIRCUITS.

2.1 Apply Binary Addition Concepts.
- 2.1.1 Discuss Half Adder Circuit.
- 2.1.2 Discuss Full Adder Circuit.
- 2.1.3 Discuss N bit Binary Adder Circuit

2.2 Understand Binary Arithmetic functions with complements
- 2.2.1 Apply 2's and 1's Complement Notation in Addition and Subtraction.
- 2.2.2 Discuss Binary Subtractor Circuit
- 2.2.3 Discuss Binary Adder/ Subtractor Circuit.

3. COMBINATIONAL CIRCUIT DESIGN.

3.1 Discuss Paradigm for Combinational Logic Problems.
- 3.1.1 Describe Word Problem.
- 3.1.2 Construct Truth Table
- 3.1.3 Create a Logic Equation from a Truth Table
- 3.1.4 Simplify the logic Equation
- 3.1.5 Develop Combinational Logic Circuits

3.2 Understand specific Application MSI Gates
- 3.2.1 Differentiate Level of Integration (SSI, MSI, LSI)
- 3.2.2 Discuss Display Drivers
- 3.2.3 Discuss Code Converters
  - 3.2.3.1 Describe BCD to Decimal Converter.
  - 3.2.3.2 Describe Decimal to BCD Converter.
  - 3.2.3.3 Describe Binary to Hexadecimal Converter.
  - 3.2.3.4 Describe BCD to seven segment Decoder.
- 3.2.4 Describe Decoding Circuits
- 3.2.5 Describe Multiplexing Circuits
- 3.2.6 Describe Demultiplexing Circuits

4. SEQUENTIAL CIRCUITS.

4.1 Understand Sequential Logic.
- 4.1.1 Describe Latches
- 4.1.2 Describe RS Flip Flop
- 4.1.3 Describe Clocked RS Flip Flop

4.2 Understand JK Flip Flop
- 4.2.1 Describe Operation of JK Flip Flop
- 4.2.2 Describe Asynchronous Inputs
- 4.2.3 Describe Synchronous Inputs

4.3 Understand Triggers
- 4.3.1 Describe Positive-Edge Trigger
- 4.3.2 Describe Negative-Edge Trigger
- 4.3.3 Describe Positive-Level Trigger (Latch)
- 4.3.4 Describe Negative-Level Trigger (Latch)

4.4 Discuss Flip Flops
- 4.4.1 Describe Master Slave Flip Flop
- 4.4.2 Describe D type Flip Flop
- 4.4.3 Describe T type Flip Flop

4.5 Multivibrators.
- 4.5.1 555 Timer
- 4.5.2 555 Timer as Monostable Multivibrator (One Shot)
- 4.5.3 555 Timer as Astable Multivibrator (Free Running)

5. SHIFT REGISTERS AND COUNTERS.

5.1 Shift Register
- 5.1.1 Function of Shift register
- 5.1.2 Types of Shift register
- 5.1.3 Integrated Shift register

5.2 Asynchronous Counters.
- 5.2.1 Discrete Ripple Counter
- 5.2.2 Discrete Modulus- N Ripple Counter
- 5.2.3 Integrated Ripple Counter (7493)

5.3 Synchronous Counter.
- 5.3.1 Discrete Up Counter.
- 5.3.2 Discrete Down Counter.
- 5.3.3 Discrete Modulus-Synchronous Counter.

6. FAMILIES AND SPECIFICATIONS

6.1 Understand Logic Families
- 6.1.1 Discuss RTL
- 6.1.2 Discuss DTL
- 6.1.3 Discuss ECL
- 6.1.4 Discuss TTL
- 6.1.5 Discuss IIL
- 6.1.6 Discuss MOS
- 6.1.7 Discuss CMOS
- 6.1.8 Describe Interfacing Different Logic Families.

6.2 Understand Specification Sheets
- 6.2.1 List Electronic Sites
- 6.2.2 Discuss Voltage Levels
- 6.2.3 Discuss Current Levels
- 6.2.4 Discuss Fan-out, Fan-in
- 6.2.5 Understand Switching Characteristics- Propagation Delay, Noise Margin, Power dissipation.

7. INTERFACING WITH ANALOG WORLD

7.1 Understand Digital to Analog Conversion.
- 7.1.1 Discuss needs and applications of DACs
- 7.1.2 Describe Binary weighted DAC
- 7.1.3 Describe Ladder type DAC

7.2 Analog to Digital Conversion.
- 7.2.1 Discuss needs and applications of ADCs
- 7.2.2 Describe the construction and working of Simultaneous ADC
- 7.2.3 Describe the construction and working of Counter type ADC
- 7.2.4 Describe the construction and working of Dual slop ADC
- 7.2.5 Describe the construction and working of Successive Approximation ADC

8. MEMORY

8.1 Discuss Memory Technologies.

8.2 Discuss General Memory Operation.

8.3 Describe Memory Considerations

8.4 List Types of Memories
- 8.4.1 Describe ROM
- 8.4.2 Describe RAM
- 8.4.3 Describe SRAM
- 8.4.4 Describe DRAM
- 8.4.5 Describe PLDs.
- 8.4.6 Describe Magnetic and Optical Memories

8.5 Discuss applications in Digital systems.

9. BIPOLAR JUNCTION (BJTs) & FIELD EFFECT (FET).

9.1 Understand bipolar junction, its biasing and basic BJT circuits.
- 9.1.1 Draw and label physical structure and symbols for NPN and PNP transistors.
- 9.1.2 Show the four operation mode of BJT and application of each mode (cut off active, active and inverse).
- 9.1.3 Explain the working of basic BJT voltage amplifier w.r.t. bias of junctions, flow of charge carriers and transistor currents.
- 9.1.4 Define cut off and breakdown voltages of transistor.
- 9.1.5 Drive the expression for I_C versus I_B for CE configuration in the active region.
- 9.1.6 Sketch the input and output static characteristics curves for common base (CB) amplifier.
- 9.1.7 Repeat 3.1.8 for CE amplifier.
- 9.1.8 Repeat 3.1.8 for CC amplifier.
- 9.1.9 List the types of transistor structures.
- 9.1.10 Enlist the advantages of I.C. over conventional circuit
- 9.1.11 Identify the high frequency limitations of BJT.

9.2 Discuss the operation of Transistor as a switch.

9.3 Discuss the operation of Transistor Clipper.

9.4 Understand Field Effect Transistors.
- 9.4.1 Explain the principle of the n-channel JFET using illustrations.
- 9.4.2 Sketch the construction of n-channel JFET & its symbol.
- 9.4.3 Sketch & label a family of drain characteristics of a n-channel JFET.

9.4.4 Define the terms I Dss and Vp.
9.4.5 Explain the effect of change in VGS the JFET characteristics.
9.4.6 Explain above from1.4.1 to. 1.4.3 for p-channel JFET.
9.4.7 Define the major data-sheet parameter of a JFET.
9.4.8 Explain the principle of n-channel enhancement MOSFET.
9.4.9 Sketch & label the family of drain characteristics of n-channel enhancement MOSFET
9.4.10 Repeat 4.4.9 for n-channel depletion-enhancement MOSFET.
9.4.11 Sketch symbols for p & n-channel JFET, n-channel enhancement MOSFET, p- and n- channel depletion- enhancement MOSFET.
9.4.12 List three advantages of n-channel over p-channel MOSFET.
9.4.13 List the applications of MOSFET.
9.4.14 Sketch the cross section of complementary MOSFET (CMOS).
9.4.15 List the applications of CMOS.

9.5 Understand FET Biasing
9.5.1 Explain to FET biasing.
9.5.2 Draw DC load line and locate bias point on the family of drain characteristic curves of JFET.
9.5.3 Draw a self-bias arrangement p-channel & n-channel JFET.
9.5.4 Set the Q-point for a self-biased JFET.
9.5.5 Explain the Q-point stability of a JFET.

10. SPECIAL DEVICES.

10.1 Understand the characteristics and applications of diode used for a special purposes Zener Diode.
10.1.1 Explain the construction of Zener and draw its symbol
10.1.2 Draw the V-I characteristic of a Zener diode.
10.1.3 Identify the characteristic features of Zener diode.
10.1.4 Explain the working of Zener diode as voltage regulator.
10.1.5 List the applications of Zener diode.

10.2 Understand the characteristics of Optical Diodes (LED, LCD and Photodiode)
10.2.1 Define the term optical devices.
10.2.2 List the name of opto electronic devices.
10.2.3 Explain the electroluminescence process in LED.
10.2.4 List the applications of LEDs.
10.2.5 Describe the term Liquid crystal.
10.2.6 Explain the working principle of both types of LCD.
10.2.7 Compare LCD with LED.
10.2.8 List the applications of LCDs.
10.2.9 Explain the operation of a photo diode.
10.2.10 List the applications of photodiodes.
10.2.11 Draw a circuit of photoelectric relay using a photodiode.
10.2.12 Define the term of Tunnel diode.
10.2.12.1 Discusses negative resistance in Tunnel diode.
10.2.12.2 Explain working of Tunnel diode Oscillator.
10.2.13 Describe construction of LASER Diode.
10.2.13.1 Discuss working principle of LASER Diode.
10.2.13.2 List uses of LASER Diode.

10.3 Understand thyristors UJT with their applications.

10.3.1 Explain the term thyristor

10.3.2 Name the important thyristor family devices

10.3.3 Discuss an SCR.

10.3.4 Draw and label the schematic symbol for an SCR

10.3.5 Explain the turn-on process of SCR using transistor equivalent circuit.

10.3.6 Sketch and label the V-I characteristics for an SCR.

10.3.7 Interpret the SCR data sheet parameters.

10.3.8 Explain the phase-control of an SCR.

10.3.9 Draw basic circuits for SCR used in the areas of

a) Power control
b) Switching and
c) Protection

10.3.10 Explain briefly the circuits drawn under 2.3.9.

10.3.11 Compare a Diac with SCR in terms of

a) Basic structure
b) Symbol
c) Operation

10.3.12 Compare a Triac with an SCR in terms of

a) Basic structure
b) Symbol operation

10.3.13 Sketch and label the transistor equivalent circuit for a Triac

10.3.14 Explain the phase-shift control of Triac with a Diac as a switching device as used in light for UJT.

10.4 Understand Uni-junction Transistor characteristics.

10.4.1 Sketch the structure of a unijunction transistor (UJT).

10.4.2 Sketch the equivalent circuit and symbol for UJT.

10.4.3 Explain the working of UJT circuit of 2.4.2.

10.4.4 Draw the V-I characteristic curve for UJT.

10.4.5 Draw a circuit for UJT relaxation oscillator.

10.4.6 List the three factors controlling the period of oscillation frequency of a relaxation oscillator.

10.5 Understand properties of Photo-sensitive BJT&LASCR.

10.5.1 Compare a photo-transistor with a conventional BJT.

10.5.2 List the factors controlling collector current of a photo transistor.

10.5.3 Draw the circuit for forward and reverse acting light operated relay using a phototransistor.

10.5.4 Sketch the circuit of a photo Darlington pair

10.5.5 List the requirements to turn-on and turn-off of light activated SCR (LASCR).

10.5.6 List the types of input devices normally used in a opt coupler

10.5.7 List five types of output devices used in opto-coupler.

10.5.8 List the applications of opto-coupler.

Total Contact Hours: **Practical: 96 Hours.**

LIST OF PRACTICAL

1. Assemble Half Adder and verify its operation.
2. Assemble Full Adder and verify its operation.
3. Assemble Binary Subtractor Circuit and verify its operation.
4. Assemble Binary Adder/ Subtractor Circuit and verify its operation.
5. Verify the operation of BCD to Decimal Converter.
6. Verify the operation of Decimal to BCD Converter.
7. Construct an RS Flip Flop using NAND gates.
8. Demonstrate the logical properties of clocked JK master/slave flip-flop.
9. Demonstrate the logical properties of D Type Flip Flop.
10. Demonstrate the logical properties of T Type Flip Flop.
11. Assemble a Monostable Multivibrator with the help of 555 Timer.
12. Assemble a Astable Multivibrator with the help of 555 Timer.
13. Construct a 4 bit shift register and study its operation.
14. Construct an 8 bit binary counter and study its operation.
15. Interfacing TTL with CMOS and CMOS with TTL ICs.
16. Construct a Binary weighted DAC and study its operation.
17. Construct a Ladder ADC and study its operation.
18. Plot the input & output characteristics of a transistor in common base configuration.
19. Plot the input & output characteristics of a transistor in common emitter configuration.
20. Plot the input and output characteristics of transistor in common collector configuration.
21. Assemble a BJT Switch circuit and check it's in put and out put.
22. Plot the transfer characteristics curve of transistor in CE configuration.
23. Assemble a transistor voltage amplifier and find its voltage gain.
24. Consult data sheet for a FET to study its parameters and ratings.
25. Demonstrate MOSFET as a switch and study its performance.
26. Draw the forward and reveres characteristics of a Zener diode.
27. Use a Zener diode as voltage regulator with diode rectifier.
28. Assemble a Zener diode Limiter circuit and observe it's in put and out put waveforms.
29. Assemble a seven segment display with the help of LEDs.
30. Assemble a circuit of photoelectric relay using a photodiode.
31. Assemble a UJT relaxation oscillator and observe its waveform.
32. Assemble a light dimmer with the help of Diac and Triac.

Course Code: **IoT 233 with new code**	**T**	**P**	**C**
Course Title: **Operating System**	**1**	**3**	**2**

Operating System is a course on the main system software that manages the resources of the computer system. It aims to provide students with the understanding and operational principles of operating system. The course covers the issues of managing the resources of a computer by an operating and the implementation and techniques used by Unix/Linux system to address the issues. This comes with laboratory to enhance the classroom discussion.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the concepts and issues of managing the resources of a computer by an operating system.
- Understand the operational principles and implementation of Unix/Linux/Linux operating system
- Use shell commands to administer the system.
- Run application programs in Unix/Linux/Linux environment
- Perform system administer
- Demonstrate motivation to use and administer systems in Unix/Linux/Linux platform

COURSE OUTLINE

Contents	***Hours***
1. Computer System Structures	**4**
1.1. Computer System Operation	
1.2. I/O Structure	
1.3. Storage Structure and Hierarchy	
1.4. Hardware Protection	
2. Operating System Structures	**4**
2.1. System Components	
2.1.1. Process Management	
2.1.2. Memory Management	
2.1.3. Disk and Storage Management	
2.1.4. File System	
2.2. OS Services and System Calls	
2.3. System Programs and Structure	
2.4. System Design and Implementation	
3. Unix/Linux Implementation	**4**

3.1. Logging In and Logging Out to the System
3.2. Configuring the Environment and Managing the Password
3.3. Unix/Linux Manual System
3.4. Unix/Linux File System and File System Organization
3.5. File Types, Names and Directories
3.6. Managing Directories: File and Directory Permissions

4. Unix/Linux Commands **6**
4.1. User-Related, Locating and Search
4.2. Usage Determination and Process-related Commands
4.3. File and Directory Manipulation
4.4. File Content and File Content Search
4.5. Printing and Scheduling
4.6. Storage and Status
4.7. Miscellaneous Commands

5. **Introduction of IoT Operating System** **2**

6. Types of IoT Operating System **6**
6.1. Advantages and Disadvantages
6.2. Features

7. System Administration **6**
7.1. System Administration Tasks
7.2. Unix/Linux Installation Basics
7.3. Resource and User Administration
7.4. File System and Disk Administration
7.5. System Accounting and Performance Monitoring
7.6. Device and Mail Administration
7.7. UUCP and FTP Services Administration
7.8. Backing Up and Restoring the System

Total Hours: ***32***

References

- **Operating System Concepts, 5Ed**., A. Silverschatz and P. Galvin, Addison-Wesley Publishing Co.
- **Unix/Linux Unleashed, 3Ed**, Robin Burk, et al., Sams Publishing
- **The Linux User's Guide**, Larry Greenfield
- **Unix System Management**, Robert King Ables
- **Red Hat Linux 6.0**, Red Hat Software, Inc.
- **Hand-on Unix: A Practical Guide with the Essentials**, Sobell
- **The Linux Users' Guide**, Larry Greefield
- **UNIX-The Text Book by Mansoor Sarwar**

LIST OF PRACTICAL

1. Logging On and Logging Out in Unix/Linux System
2. Setting the password
3. Configuration of Own Environment
4. Using Manual Pages
5. Using User-related Commands login, rlogin, telnet, passwd, exit, which, whence, where, man
6. Using Process-related Commands: kill, nice, ps, jobs, wait, nonup, sleep,
7. Using File and Directory Commands: touch, chmod, chgrp, chown, rm, mv, cp, cat, rcp, ln, mkdir, rmdir, ls, find, file
8. Using File Content and Search Commands: more, less, tail, head, wc, read, od, pg, tee, vi, egrep, fgrep, strings
9. Using Printing and Scheduling Commands: cancel, lp, pr, lpstat, at, atq, crontab
10. Using Storage and Status Commands: compress, cpio, dd, pack, pcat, tar, uncompress, unpack, zcat, date, env, iostat, sar, uname, uptime, vmstat
11. Using Text Processing Commands: cut, ex, fmt, fold, join, paste, sort, tr, uniq, sed
12. Using Miscellaneous Commands: banner, bc, cal, clear, time
13. Text Editing Using vi
14. Installing Unix/Linux
15. Adding New User
16. Mounting and Unmounting File System
17. Creating and Repairing File System
19. Manual System Accounting Setup
20. System Accounting Report Generation
22. Connecting and Setting Up Printers
23. Backing up and Restoring System

IoT 233 – Operating System

INSTRUCTIONAL OBJECTIVES

1. Computer System Structures

1.1. Describe the general operations of computer
1.2. Describe interrupts
1.3. Identify different I/O devices
1.4. Describe the structure of input/output system
1.5. Describe different storage devices
1.6. Explain the hierarchy of storage devices
1.7. Identify the protection issues encountered in a computer system
1.8. Describe protection methods of computer operation

2. Operating System Structures

2.1. List functions of an operating system
2.2. Describe the functions of an operating system
2.3. Explain memory management techniques.
2.4. Describe virtual memory
2.5. Describe hierachical directory system.
2.6. Describe UNIX file system
2.7. Explain disk management system
2.8. Explain how the operating system manages the resources of a computer
2.9. Enumerate OS services and explain the service
2.10. Define system calls
2.11. Identify system programs that come with the operating system
2.12. Describe the functions of these system programs
2.13. Describe the general structure and architecture of an operating system
2.14. Illustrate the structure by diagrams
2.15. Discuss design goals of the operating system

3. Unix/Linux Implementation

3.1. Discuss the development of Unix/Linux development
3.2. Explain the design principles of Unix/Linux
3.3. Log in and log out in the system
3.4. Configure the user own environment
3.5. Change and manage own password
3.6. Use Unix/Linux help system (Manual System)
3.7. Characterize Unix/Linux file system and its organization
3.8. Name correctly file and directory
3.9. Create and delete files and directories
3.10. Set the permissions of files and directories

4. Unix/Linux Basic Commands

4.1. Invoke correctly Unix/Linux commands used in user and user-determination and file search

4.2. Invoke correctly Unix/Linux commands used in administration of own environment and process-related job
4.3. Use correctly Unix/Linux commands to manipulate files and directories
4.4. Use correctly Unix/Linux commands to search and view at contents of files
4.5. Print files using Unix/Linux commands
4.6. Use correctly Unix/Linux scheduling commands
4.7. Use correctly Unix/Linux storage and status commands
4.8. Invoke correctly text processing command
4.9. Use other miscellaneous commands available to Unix/Linux

5. Introduction of IoT Operating System

5.1. IoT Operating System
5.2. Purpose of IoT Operating System
5.3. Do IoT Devices have an OS.

6. Types of IoT Operating System

6.1. Types
6.1.1. Mbed OS
6.1.2. TinyOS
6.1.3. Contiki
6.1.4. RIOT OS
6.1.5. Ubuntu Core
6.1.6. Tizen
6.1.7. Apache Mynewt
6.1.8. Zephyr
6.1.9. Android Things
6.1.10. Windows 10 IoT
6.1.11. Embedded Linux
6.2. Advantages and Disadvantages of types
6.3. Types features

7. System Administration

7.1. Describe Unix/Linux system administration
7.2. Describe tasks of Unix/Linux system administration
7.3. Identify hardware requirements of Unix/Linux system
7.4. Plan and Install Unix/Linux
7.5. Start up and shutdown Unix/Linux
7.6. Add and maintain new users in the system
7.7. Set permission to users
7.8. Manage and repair file systems
7.9. Create file systems
7.10. Describe Unix/Linux system basic accounting
7.11. Set up accounting system in Unix/Linux
7.12. Describe performance monitoring in Unix/Linux
7.13. Use tools for monitoring performance of the system
7.14. Describe services facility provided by Unix/Linux

7.15. Describe device administrative tasks
7.16. Install printer to Unix/Linux system
7.17. Describe email facility of Unix/Linux
7.18. Describe mail transfer agents
7.19. Explain UUCP and FTP services
7.20. Describe FTP protocol
7.21. Setup and administer FTP services
7.22. Explain purpose of backup
7.23. Back -up and restore Unix/Linux system

Course Code: **CIT- 263**	**T**	**P**	**C**
Course Title: **Relational Data Base Management System**	**2**	**3**	**3**

Databases are part of our everyday life. Whether we are accessing our bank accounts, paying bills, searching the Web or calling a call centre, our requests are most likely posted to a database management system. The aim of the course is a paradigm shift from "computation" to "information" and covers some of the core concepts on data structuring and querying. It covers fundamentals of database architecture, database management systems, and database systems, Principles and methodologies of database design, and techniques for database application development.

Course Objectives

At the end of the course, the students are expected to be able to

- Design and Implement a Relational database for real life problems
- Write Complex Queries and Use SQL
- Suggest a Centralized / Distributed system according to organizational needs
- Design and implement solutions for the small business organizations

COURSE OUTLINE

Contents	***Hours***
1. Introduction Introducing the Database Management System Field Definitions and Naming Conventions Components of DB Applications DB Tools; Microsoft Access, MySQL	**6**
2. Database System Legacy DB Systems File Processing Systems Hierarchical Model Network Model	**4**
3. Database Models Semantic Data Model Relational Model Database Models and the Internet	**4**
4. Relational Database Management Systems A logical view of Data; Entities and Attributes Tables and their Characteristics, Keys Integrity rules Entity and referential integrity Relational Database operators	**6**
5. Normalization of Database Tables Need for Normalization	**6**

Conversion to First Normal Form
Conversion to Second Normal Form
Conversion to Third Normal Form
Boyce-Codd Normal Form (BCNF)

6. Relational Algebra and SQL **16**
Unary and Binary operations
Cartesian Product
Set Operations
SQL Operators
Relational Algebra and SQL
Introduction to DDL and DML
Data Control Language
Aggregate Function in SQL, Grouping Data

7. Database Life Cycle (DBLC) **4**
Database Initial Study
Database Design
Database Design Strategies
Centralized versus Decentralized Design

8. Entity Relationship (E-R) Modeling **12**
Basic Modeling Concepts
Degrees of Data Abstraction
Association and Cardinality
Relationship Participation
Composite Entities, Entity Super types and subtypes
Enhanced Entity Relationship Diagram
Transform ER/EER to Relational Model

9. Transaction Management **6**
What is a Transaction?
Evaluating Transaction Results
Transaction Management with SQL
Transaction Log, Transaction Types

Total Hours: 64

References

- **Fundamentals of Database Systems**
- Ramez Elmasri, Shamkant Navathe
- 5th Edition 2009 ISBN: 9788131716250
- **Database Management Systems**
- C. J. Dates
- 8th Edition, 2001 ISBN 0-901-543432-8
- **Database System Concept**
- Peter Rob, Carlos Coronel
- ISBN: 9788131509708
- **Introduction to PL\SQL by Oracle Press**

LIST OF Practicals

Sr.	Lab- Topics/ Practical
01.	Introduction to Microsoft Access Installation and basic usage
02.	Introduction to MySQL database management system Installation and basic usage
03.	Create Database Create Table, Data types, DML (insert, delete, update) operations Concept of primary key
04.	More than One table Concept of join and foreign key, Referential Integrity Cascade update and Cascade delete operations Master-Details tables and DML
05.	Concept of QBE (Query by Example) grid in MS Access Writing Queries using QBE Aggregate functions Datasheet, SQL and design view
06.	Simple Select Statement Select and Project operations Where clause
07.	Operators (Arithmetic, Logical, Concatenation) Null value in Expressions Between, In , Like operators Column Alias Sorting (order by clause) Single Row Functions
08.	Group functions Group By, Having Clause Joins & Types
09.	Database Concepts DDL and DML Transactions
10.	Database Connectivity with mySQL
11.	Database Connectivity(Login Problem) Save, Retrieve, Update using PHP & MySQL Data movement between page navigation
12.	User Level Security and Access Rights Relational Modeling using Erwin

CIT-263 – Relational Data Base Management System

INSTRUCTIONAL OBJECTIVES

After completing this course the student must demonstrate the knowledge and ability to:

1. Understand the needs of a DBMS software
2. Describe the components of a database and its naming conventions.
3. Clear overview of different existing DMS tools like MS Access and MySQL
4. Understand, appreciate and effectively explain the underlying concepts of legacy and latest database technologies.
5. Understand different models of DBMS, like hierarchical and network.
6. Understand the pros and cons of semantic and relational data models.
7. Understand and apply integrity rules on a data base
8. Understand the difference between entity integrity and reverential integrity.
9. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
10. Have clear understanding of relational database operators.
11. Understand the need for normalization.
12. Understand the steps required to normalize a database.
13. Should be able to practically bring a database from 1st normal form to BCNF
14. Normalize a database
15. Understand the set operations and SQL operators
16. Understand of Data Manipulation Language (DML), Data Definition Language (DDL), and Data Control Language (DCL)
17. Populate and query a database using SQL DML/DDL commands.
18. Understand all the steps required to design a basic database to meet the need of an organization.
19. Design and implement a database schema for a given problem-domain
20. Understand the importance of database modeling using ER-model and enhanced ER-model
21. Understand the difference between entities, super-types, and subtypes.
22. Should be able to transform ER / EER to relational model
23. Differentiate between transaction processing system and functional area information system
24. Understand the difference between transaction log and transaction types

Course Code: 221	T	P	C
Course Title: **Introduction to IoT Engineering**	**1**	**0**	**1**

Introduction to IoT Engineering is a course mainly introduces the architecture, key technologies and typical applications of the Internet of Things systematically. Starting from the three-layer model of the perception layer, network layer and application layer of the Internet of Things, the main functions and key technologies of each layer are expounded respectively, so that students can master the solid basic concepts and knowledge of the Internet of Things.

Course Objectives

At the end of the course the students are expected to be able to

- Cultivate the consciousness of diligent practice and innovation.
- Master the definition, basic principles and application of the Internet of Things technology.
- Understand the development of the Internet of Things technology, and understand the key technologies and methods of the Internet of Things.
- It can enhance students' ability to use the theoretical knowledge to solve practical problems in relevant professional fields.
- Cultivate students' ability to comprehensively apply their knowledge.
- Improve students' interest in self-study.

COURSE OUTLINE

Contents	***Hours***
1. Overview of IoT	**2**
1.1. Definition of IoT	
1.2. Origin of IoT: "Lazy people" change the world	
1.3. Three-tier architecture of IoT	
1.4. Typical applications of IoT	
2. Sensor Technology	**2**
2.1. Analog Quantity	
2.2. Digital Quantity	
2.3. Switching Quantity	
2.4. Sensor Application Cases	
2.5. Sensor Design	
3. Automatic Identification Technology	**4**
3.1. Definition of Automatic Identification Techniques	
3.2. Bar Code Technology	

3.3. RFID Technology
3.4. Classification of Biometric Technologies
3.5. Characteristics of The Biometric Technology
3.6. Multi-biometric Technology

4. Embedded System **2**
4.1. Definition of Embedded System
4.2. Structure of Embedded System
4.3. Features of Embedded System
4.4. Embedded Processor
4.5. Embedded Operating System

5. Overview of Bus **2**
5.1. Definition of Bus
5.2. Classification of Bus
5.3. Data Communication Mode
5.4. Common Bus

6. Short-distance Wireless Communication Technology **4**
6.1. Principle of Wireless Communication
6.2. Wireless Spectrum
6.3. Communication Mode of Radio Waves
6.4. Classification of Short-distance Wireless Communication Technology

7. Long-distance Wireless Communication Technology **4**
7.1. 2G and GPRS
7.2. 3G
7.3. 4G
7.4. 5G
7.5. NB-IoT

8. Cloud Computing **2**
8.1. Definition of Cloud Computing
8.2. The Principle of Cloud Computing
8.3. Three Delivery Modes of Cloud Computing
8.4. Four Deployment Modes of Cloud Computing
8.5. Five Major Features of Cloud Computing
8.6. The Application of Cloud Computing

9. Big Data Technology **2**
9.1. Definition of Big Data
9.2. Magnitude of Data
9.3. The Characteristics of Big Data
9.4. Development Trend of Big Data
9.5. NB-IoT

10. The IoT Security Mechanism **2**
10.1. Information Security Foundation
10.2. Overview of IoT Security

10.3. The IoT Information Security System

11. Typical Application Systems of IoT **4**

11.1. Fire Monitoring System
11.2. Production Line Environmental Monitoring System
11.3. Parking Lot Environment Monitoring System
11.4. Smart Agricultural Greenhouse Management System
11.5. Smart Home Environment Monitoring System

Total Hours:	***32***

References

- **Introduction to IoT Engineering**, Shiming Li, Publishing House of Electronics Industry
- **Introduction to IoT, Fei Ding, et al.,** The People's Posts and Telecommunications Press
- **Introduction to IoT**, **BinJia Wang, et al.,** tsinghua university press
- **Introduction to IoT**, **Yulan Huang,** The People's Posts and Telecommunications Press

IOT 221 – Introduction to IoT Engineering

INSTRUCTIONAL OBJECTIVES

1. Overview of IoT

1.1. Define the IoT
1.2. Explain the origin of IoT
1.3. Identify three-layer architecture of the Internet of Things
1.4. Describe typical applications of the Internet of Things

2. Sensor Technology

2.1. List functions of an operating system
2.2. Explain the characteristics of the simulated quantities
2.3. Explain the characteristics of the numerical quantities
2.4. Explain the characteristics of the switching volume
2.5. Explain the selection principles of the sensors
2.6. Explain the design principle of the sensor
2.7. Describe the trends of sensors

3. Automatic Identification Technology

3.1. Define automatic identification techniques
3.2. Description the characteristics of one-dimensional codes
3.3. Describe the characteristics of the QR code
3.4. Describe the characteristics of the RFID
3.5. Describe the principle and characteristics of fingerprint recognition technology
3.6. Describe the principle and characteristics of face recognition technology
3.7. Describe the principle and characteristics of iridine recognition technology
3.8. Describe the principle and characteristics of sound print recognition technology
3.9. Describe the principle and characteristics of finger vein recognition technology
3.10. Describe the principle and characteristics of gait recognition technology
3.11. Describe the principle and characteristics of gene recognition technology
3.12. Discuss the application cases of biometric technology
3.13. Discuss the application of multibiometric technology

4. Embedded System

4.1. Define embedded system
4.2. Describe the structure of the embedded systems
4.3. Explain the four stages of the development of embedded systems
4.4. Describe the characteristics of the embedded systems
4.5. Describe the characteristics of the embedded processors and Embedded operating system

5. Overview of Bus

5.1. Define the bus
5.2. Explain the classification of bus
5.3. Explain the characteristics of mono communication
5.4. Explain the characteristics of the half-duplex
5.5. Explain the characteristics of the full-duplex
5.6. List common buses

6. Short-distance Wireless Communication Technology

6.1. Explain the rationale of wireless communication
6.2. Explain the characteristics of the electromagnetic spectrum
6.3. List the radio wave communication modes
6.4. Explain the characteristics of Bluetooth technology
6.5. Explain the characteristics of Wi-Fi technology
6.6. Explain the characteristics of LoRa technology
6.7. Explain the characteristics of ZigBee technology
6.8. Explain the characteristics of Bluetooth technology

7. Long-distance Wireless Communication Technology

7.1. Explain the characteristics of 2G technology
7.2. Explain the characteristics of GPRS technology
7.3. Explain the characteristics of 3G technology
7.4. Explain the characteristics of 4G technology
7.5. Explain the characteristics of 5G technology
7.6. Explain the characteristics of NB-IoT technology

8. Cloud Computing

8.1. Define cloud computing
8.2. Explain the principles of cloud computing
8.3. List the three delivery modes for cloud computing
8.4. List the four deployment modes for cloud computing
8.5. Describe the top five major features of cloud computing
8.6. Discuss the application of cloud computing

9. Big Data Technology

9.1. Define the big data
9.2. Explain the magnitude of data
9.3. Explain the characteristics of big data
9.4. Discuss the development trend of big data

10. The IoT Security Mechanism

10.1. Explain the concepts and basic attributes of information security
10.2. List the main threats and solutions to information security
10.3. Discuss the Internet of Things security threat cases
10.4. Discuss the challenges of IoT security
10.5. Describe the hierarchical security model and architecture of the Internet of Things
10.6. Discuss perception layer security, network layer security and application layer security
10.7. Explain the characteristics of ZigBee technology
10.8. Explain the characteristics of Bluetooth technology

11. Typical Application Systems of IoT

11.1. Explain the implementation principle of fire monitoring system
11.2. Explain the implementation principle of production line environmental monitoring system
11.3. Explain the implementation principle of parking lot environment monitoring system
11.4. Explain the implementation principle of smart agricultural greenhouse greenhouse management system
11.5. Explain the implementation principle of smart home environment monitoring system

Course Code: **CIT -303**	**T**	**P**	**C**
Course Title: **Web Development with JAVA**	**1**	**3**	**2**

A course introducing the design and development of a Web page with JAVA. It intends to provide the trainees with working knowledge on creating a Web page using JAVA programming language. It covers the discussion on the WWW and the Internet, HTML and CSS basics, JAVA Script, JQuery, JAVA Servlets, JSP, Session Management, JDBC Programming, JSF, tools, linking, FrontPage basics, formatting, multimedia, and site creation and maintenance. Java has strong support for web development. While Java on the desktop, with the notable exception of Eclipse RCP based application was never a huge success, Java is frequently used at the server side. This has a laboratory component to enhance learning.

Course Objectives

At the end of the course the students are expected to be able to

- Describe Web development technologies
- Describe the concepts and methods of designing a Web page for the World Wide Web.
- Use any text editor to create an HTML code.
- Use the elements of the HTML to format a Web page
- Install necessary software for Setting up development Environment
- Explain and apply HTML and CSS tags
- Apply Java Script in webpages
- Apply JQuery within webpages
- Describe and use Java servlets
- Explain and apply Java Server Pages elements
- Explain and use Session Management applications and techniques
- Explain JDBC, configure MySQL and use its methods
- Customize Tags
- Explain and apply use Java Server Faces

COURSE OUTLINE

Contents	**Hours**
1. Introduction to Web Development	**2**
1.1 What is a Web Application? 1.2 HTTP Basics 1.3 Types of HTTP Requests 1.4 Server Side Programming 1.5 Client Side Programming 1.6 Web Application Layers	
2. Setting up Development Environment	**2**

2.1 Installation of Apache Tomcat Server
2.2 Installation of IDE (Eclipse / NetBeans)
2.3 Standard Directory Structure of Java Web Application
2.4 Development of Web Application

3. HTML and CSS **2**
3.1 Describe Html Document Structure and Tags
3.2 Describe CSS Styles
3.3 Designing Tables
3.4 Designing Forms
3.5 Advance Page Layout

4. Javascript **3**
4.1 Introduction to Javascript
4.2 Hiding and Showing Elements
4.3 Styling Elements
4.4 Using Jquery
4.5 Jquery Selectors
4.6 Validating Forms

5. Java Servlets **4**
5.1 What is a Servlet?
5.2 Advantages of Servlet
5.3 Servlet Types
5.4 Writing Basic Hello World Servlet
5.5 Servlet Life Cycle
5.6 Servlet and Forms
5.7 Servlet and Input Validation

6. Java Server Pages **3**
6.1 Introduction
6.2 Life Cycle of JSP
6.3 JSP Elements
6.4 JSP Standard Actions

7. Session Management **2**
7.1 What is a Session?
7.2 What is a Cookie?
7.3 URL Rewriting
7.4 Hidden Field
7.5 Working with HTTP Session

8. JDBC Programming **8**
8.1 Introduction
8.2 Configure MySQL
8.3 Connecting to the Database
8.4 Accessing Data
8.5 The execute Query Method
8.6 The execute Update Method

9. Custom Tags **2**

9.1 Custom Tags Overview
9.2 Custom Tag Handlers
9.3 Customizing Tag behavior with attributes

10. Java Server Faces **4**

10.1 Introduction
10.2 Using JSF with JSP
10.3 JSF Life Cycle
10.4 Events Handling
10.5 JSF Tag Library

Total Hours: 32

References:

- **Learning Web Design: A Beginner's Guide to (X)HTML, Stylesheet and Web** by Jennifer Niederst Robbins
- **Beginning JSP, JSF and Tomcat** by Giulio Zambon

Web Development with JAVA
LIST OF PRACTICAL

1. Installation of Apache Tomcat Server
2. Installation of IDE (NetBean)
3. Deploy simple website in Apache Tomact Server
4. Design a Page Layout using Html and CSS
5. Install ODBC Driver
6. Install and Configure MySQL
7. Design User Registration Form and Store User in Database
8. Design Login User Form and Validate User
9. Show All Registered Users in a grid
10. Search users by name and show in grid.
11. Update User Profile
12. Form Validation using JQuery
13. Create a form using Java Servlet
14. Store and Retrieve data from Session
15. Create address book application

CIT -303 Web Development with Java

INSTRUCTIONAL OBJECTIVES

1. Introduction to Web Development

1.1. Define Web Application
1.2. Explain HTTP Basic
1.3. Describe Types of HTTP Request
1.4. Discuss Server Side Programming Languages
1.5. Describe Client Side Programming Languages
1.6. Explain Web Application Layers

2. Setting up Development Environment

2.1. Install of Apache Tomcat Server
2.2. Install of IDE (Eclipse / NetBeans)
2.3. Explain the Standard Directory Structure of Web Application
2.4. Develop a Web Application

3. Html and CSS

3.1. Describe Html document structure
3.2. Describe Html Elements
3.3. Implement CSS styles
3.4. Design Tables
3.5. Design Forms
3.6. Use Page Layout

4. Javascript

4.1. Explain what is Javascript
4.2. Hide and Show Elements
4.3. Apply styles on elements
4.4. Define JQUERY
4.5. Explain the JQUERY Selectors
4.6. Apply validation on HTML form

5. Java Servlets

5.1. Define Servlets
5.2. Describe the advantages of Servlets
5.3. Describe different types of a Servlets
5.4. Describe Servlet Life Cycle
5.5. Create Forms using Servlet
5.6. Add Validation on Form

6. Java Server Pages

6.1. Define JSP
6.2. Describe Life Cycle of JSP
6.3. Explain JSP Elements
6.4. Explain JSP Standard Actions

7. Session Management

7.1. Define a ‘Session’
7.2. Define a ‘Cookie’
7.3. Explain URL Rewriting
7.4. Explain Hidden Field
7.5. Use HTTP Session

8. JDBC Programming

8.1. Define JDBC
8.2. Configure MySQL
8.3. Connect the Database
8.4. Access Data
8.5. Implement execute Query Method
8.6. Implement execute Update Method

9. Custom Tags

9.1. Explain Custom Tags
9.2. Describe Custom Tag Handlers
9.3. Customize Tag behavior with attributes

10. Java Server Faces

10.1. Define JSF
10.2. Use JSF with JSP
10.3. Describe JSF Life Cycle
10.4. Explain Events Handling
10.5. Explain JSF Tag Library

Course Code: IOT-312	T	P	C
Course Title: **Wireless Transmission Technology**	**1**	**3**	**2**

This course is a professional course of Internet of Things application technology and embedded technology and application, which is a professional basic course. Students can understand how to implement some basic project procedures through the cc2530 single chip. The course is positioned for the training goals of "embedded system development engineer", "Internet of Things system maintenance engineer" and other professional positions, and is oriented to embedded system development, Internet of Things product design and other positions. The teaching process comes from the real case of the cooperative enterprise， Students can master the flow lamp, breathing lamp, serial communication, AD data acquisition and processing, cultivate students' ability of software and hardware installation and debugging, taking into account students' ability of independent innovation, active learning, as well as the ability to discover, analyze and solve problems.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the architecture and network management techniques of wireless sensor networks；
- Understand the communication protocols of wireless sensor networks;
- Proficient in wireless sensor network node location, target tracking and time synchronization and other supporting technologies;
- Proficient in GPIO, serial port, timer, interrupt, AD, peripheral programming;
- Understand Zigbee development technology;
- The ability to access and consult wireless sensor network technical data using the network, data manual, vendor directory, etc.

COURSE OUTLINE

Contents	***Hours***
1. Overview of the wireless sensor network	**6**
1.1. Basic Concepts;	
1.2. Internal structure of CC2530 MCU;	
1.3. Schematic diagram of CC2530 microcontroller and application instructions of manual;	
1.4. Build development environment for CC2530 microcontroller	
1.5. Project creation	
2. The basic application of the CC2530 single chip microcomputer	**18**
2.1. led water lamp；	
2.2. the key controls the led to light up or go out；	
2.3. Interrupt control led light or out；	

2.4. The timer turns the LED on or off；
2.5. Basic application of PWM；
2.6. Basic application of serial communication；
2.7. AD acquisition；

3. 3. Wireless communication application **8**

3.1. Wireless communication controls the leds on or off；
3.2. Wireless serial communication；
3.3. Analog quantity sensor acquisition；
3.4. Comprehensive application of wireless sensor network；

Total Hours:	***32***

References

- Vijayalakshmi S R. Wireless Sensor Networks. Mercury Learning & Information. 2018.
- Qiu Shenghui, Jiang Qiuxia, Pang Xiaomeng, Wang Bin. Research on Reliable Cluster Protocol in Wireless Sensor Network. Computer Science and Applications，2018.
- Bhagirathi Nayak;Subhendu Kumar Pani. Wireless Sensor Networks and the Internet of Things:Future Directions and Applications. Apple Academic Press. 2021.

IOT-312 **LIST OF PRACTICAL**

Equipment list：ZigBee development boards based on CC2531 chip, CC Debugger emulator, Antenna module, Serial cable.

1. CC2530 MCU schematic chip data manual query；
2. IAR,Smart RF installation；
3. CC2530 MCU new project created；
4. Program editing and burning；
5. GPIO register configuration, flow light logic program writing；
6. Interrupt register configuration, by interrupt on/off LED program writing；
7. Timer register configuration, the application of timer to achieve the flow light logic program；
8. Serial port register configuration, write a program to achieve PC and CC2530 communication；
9. AD acquisition register configuration, write a program to realize automatic lighting/extinguishing LED；
10. Breathing lamp case；
11. Construction of wireless sensor network development environment；
12. Zigbee network establishment；
13. Wireless control lighting system design；
14. Wireless chat room design；
15. Design of storage environment monitoring system.

CIT 312 – Wireless Transmission Technology

INSTRUCTIONAL OBJECTIVES

1. Computer System Structures

1.1. Master how to analyze the schematic diagram of CC2530 microcontroller and understand the basic circuit;；
1.2. Proficient in the query methods of CC2530 microcontroller chip manual and data manual;
1.3. Be able to independently build the application environment of CC2530 MCU；
1.4. Proficient in basic operations of IAR and SmartRF；

2. Operating System Structures

2.1. Understand the internal structure of embedded chips;
2.2. Master the basic principle of LED lighting and extinguishing;
2.3. Master the query and configuration of GPIO port, interrupt, timer, serial port and AD related register;
2.4. Master the minimum system circuit design method of CC2530 chip;
2.5. Master the editing process of peripheral programs;
2.6. Master the preparation and application of interrupt service functions;
2.7. Master the programming logic of LED on/off, interrupt, timer, serial port and AD conversion;
2.8. Master the practical application of PWM;
2.9. Understand the basic concepts and theoretical knowledge of serial communication;
2.10. Be able to independently design intelligent street lamp model;

3. Wireless communication application

3.1. Understand the architecture and network management technology of wireless sensor network;
3.2. Master the communication protocol of wireless sensor network;
3.3. Familiar with several supporting technologies of wireless sensor network, such as node positioning, target tracking and time synchronization
3.4. Master the writing of GPIO, serial port, timer, interrupt, AD and peripheral program;
3.5. Proficient in using AT instruction set;
3.6. Master Zigbee related basic knowledge and networking form.

Course Code: IOT-322	T	P	C
Course Title: **Identification Technology of IOT**	**1**	**3**	**2**

Internet of Things identification technology is a course about automatically obtaining the relevant information of recognized objects and providing it to the computer system for subsequent processing. This course aims to give students an understanding of the signage technology used in the Internet of Things (IOT) field. This course covers the working principles and application scenarios of IOT signage technology, as well as the technologies and solutions that enable these application scenarios.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the classification and working principle of IOT identification technology
- Master the basic concepts and system components of RFID
- Understand the working principle of tag classification, antenna and reader in RFID architecture
- Able to complete the installation and debugging, data acquisition and application development of RFID application part in the Internet of things system
- Able to complete the selection of RFID system equipment according to engineering requirements
- Understand the application of RFID in IOT application technology.

COURSE OUTLINE

Contents	***Hours***
1. Overview of IOT technology and identification technology	**4**
1.1. The origin and development of IOT	
1.2. Definition, characteristics and key technologies of IOT	
1.3. The concept of IOT identification technology	
1.4. Classification of IOT identification technologies	
1.5. State of the art of IOT identification technology	
2. RFID technology summary and working principle	**4**
2.1. Outline of RFID technology	
2.2. RFID working principle	
3. Overview of RFID system equipment	**12**
3.1. Principle and application of RFID electronic tag	
3.2. Principle and application of RFID reader	
3.3. Principle and application of RFID Middleware	
4. Design and installation of RFID access control system	**6**
4.1. Overview of RFID access control system	
4.2. Hardware composition of RFID access control system	

4.3. Function and working principle of RFID access control system

5. High-frequency campus card system **6**

5.1. Understanding High Frequency RFID

5.2. RFID high frequency reads and writes a single area

5.3. Campus card RFID system design

Total Hours:	***32***

References

- Tang Zhiling et al. Radio frequency identification application technology. China Machine Press, 2017.
- Fang Longxiong et al. RFID Technology and application. China Machine Press, 2019.
- New World education. Automatic identification technology and application.

IOT-322 LIST OF PRACTICAL

1. Equipment list: Two-dimensional code test kit, RFID test kit
2. Low frequency card serial port communication
3. Get low frequency card information
4. Low frequency card initialization operation
5. Low frequency card address space regular read and write block operations
6. Low frequency card encryption and decryption operations
7. The LF card address space protects read and write block operations
8. Comprehensive experiment of low frequency card access control system
9. High frequency RFID serial communication
10. Obtain the information of the UHF reader module
11. UHF electronic label polling operation
12. Read and write UHF electronic label data storage area experiment
13. UHF electronic tag locking and inactivation experiments

CIT 322 – Identification Technology of IOT

INSTRUCTIONAL OBJECTIVES

1. Overview of IOT technology and identification technology
- 1.1. Can name the architecture of IOT
- 1.2. Familiar with the classification of IOT identification technologies
- 1.3. Master how to install the RealView MDK integrated development environment and configure the basic project
- 1.4. Master the method of downloading programs and emulating and debugging programs

2. RFID technology summary and working principle
- 2.1. Know what is RFID technology
- 2.2. Understand the technical characteristics of RFID
- 2.3. Understand the application area of RFID technology
- 2.4. Know the relationship between RFID technology and IOT

3. Overview of RFID system equipment
- 3.1. Principle and application of RFID electronic tag
- 3.2. Principle and application of RFID reader
- 3.3. Principle and application of RFID Middleware

4. Design and installation of RFID access control system
- 4.1. Overview of RFID access control system
- 4.2. Hardware composition of RFID access control system
- 4.3. Function and working principle of RFID access control system
- 4.4. Understand the characteristics of low frequency RFID and related standards
- 4.5. Preliminary understanding and understanding of 125Khz band tag reading process
- 4.6. Understand the principle of 125Khz reading card for RFID
- 4.7. Understand the role of 125Khz read/write tags in real projects
- 4.8. Understand the working process of community access control system

5. High-frequency campus card system
- 5.1. Understanding High Frequency RFID
- 5.2. RFID high frequency reads and writes a single area
- 5.3. Campus card RFID system design
- 5.4. A preliminary understanding and understanding of the 13.56MHZ band tag reading process
- 5.5. Understand the principle of 13.56MHZ RFID reader
- 5.6. Understand the role of 13.56Mhz read/write tags in real projects

Course Code: IOT-332	T	P	C
Course Title: **Embedded Technology of IoT**	**1**	**3**	**2**

This course is a professional course of Internet of Things application technology and embedded technology and application, and is a professional basic course. Students can learn how to implement some basic project procedures with STM32 processors. The course is positioned at the training goals of professional positions such as "embedded system development engineer" and "Internet of Things system maintenance engineer", and is oriented to embedded system development, Internet of Things product design and other positions. The teaching process comes from the real cases of cooperative enterprises, students can be proficient in using the software development environment and program debugging methods of STM32 processor, master the program design methods of GPIO, interrupt, serial port, timer and other basic peripheral interfaces, cultivate students' software and hardware installation and debugging ability, take into account students' independent innovation ability, active learning ability, and ability to discover, analyze and solve problems.

Course Objectives

At the end of the course, students should be able to:

- Understand the basic concepts of embedded systems;
- Proficient in the software development environment and program debugging methods of STM32 processor;
- Master the programming methods of GPIO, serial port, interrupt, timer and other basic function peripherals;
- Learn how to develop applications independently using drivers;
- Familiar with reading chip manuals, familiar with STM32 library function manuals.

COURSE OUTLINE

Contents	***Hours***
1. Overview of embedded systems 1.1 Concept and characteristics of embedded system 1.2 Embedded System Hardware 1.3 Embedded System Software 1.4 Embedded System Programming Patterns 1.5 Program development methods for microcontrollers 1.6 Overview of STM32 microcontrollers	**4**
2. STM32 microcontroller development environment set up 2.1 Download and installation of STM32CubeMX software 2.2 Download and Installation of MDK_ARM Software	**4**
3. Use of STM32CubeMX software	**4**

3.1 Basic features of HAL libraries
3.2 Steps to use the STM32CubeMX software
3.3 Writing applications using MDK software

4. Use of MDK-ARM Software **4**
4.1 Usage process of MDK software
4.2 Applicable Functions of the MDK Software
4.3 The use of RTE environment in conjunction with STM32CubeMX

5. Universal input and output interface **4**
5.1 Control GPIOs based on HAL libraries
5.2 Task Practice
5.3 Design and porting of hardware abstraction layers

6. Interrupt the system **4**
6.1 Interrupt Overview
6.2 Interrupt handling flow of HAL library
6.3 Data types and interface functions of external interrupts
6.4 Task Practice

7. Timer **4**
7.1 Timer Overview
7.2 Design method of HAL library peripheral module
7.3 Timing function of timer
7.4 PWM output function of timer
7.5 Input capture function of timer

8. Serial communication **4**
8.1 Overview of serial communication
8.2 HAL library peripheral initialization design ideas
8.3 Serial port communication in polling mode
8.4 Serial port communication in interrupt mode
8.5 DMA mode serial port communication

Total Hours:	***32***

References

- Qi Qiang. Embedded system design – based on STM32CubeMX and HAL libraries. Higher Education Press. 2022.
- Zhang Yang, Zuo Zhongkai, and Liu Jun. STM32F7 Principles and Applications HAL Library Edition. Beihang University Press，2017.
- Gao Xiansheng. STM32F0 in practice (based on HAL library development).Machinery Industry Press. 2019.

IOT- 332 LIST OF PRACTICAL

Equipment list: M3 main control board based on STM32F103VET6 chip, ST-Link emulator.

1. Set up the development environment
2. New construction and program programming
3. GPIO port control-driver indicator
4. GPIO port control - flow light
5. GPIO port control - key detection
6. EXIT external interrupt-interrupt mode reads the key
7. EXIT External Interrupt - Change the frequency at which the indicator flashes
8. Timer - flashes the indicator
9. Timer - running light
10. Timer - Output PWM signal
11. Timer - breathing light
12. USART synchronous/asynchronous serial communication-polling mode communication (fixed-length data transmission and reception)
13. USART synchronous/asynchronous serial communication - serial port redirection
14. USART synchronous/asynchronous serial communication-interrupt serial communication (fixed-length data transmission and receiving)
15. USART Synchronous/Asynchronous Serial Communication - Enables simple frame format communication
16. ADC - Battery capacity monitoring experiment

INSTRUCTIONAL OBJECTIVES

1. Computer System Structures

1.1. Describe the general operations of computer
1.2. Describe interrupts
1.3. Identify different I/O devices
1.4. Describe the structure of input/output system
1.5. Describe different storage devices
1.6. Explain the hierarchy of storage devices
1.7. Identify the protection issues encountered in a computer system
1.8. Describe protection methods of computer operation

1. Overview of embedded systems

1.1 Master the concept and composition of embedded systems
1.2 Understand the programming mode and program development mode of embedded systems
1.3 Understand hardware abstraction layer design ideas
1.4 Understand the characteristics of STM32 microcontrollers

2. STM32 microcontroller development environment is set up

2.1 Understand the characteristics and development process of STM32CubeMX software
2.2 Complete the setup of the STM32 microcontroller development environment

3. Use of STM32CubeMX software

3.1 Understand the basic characteristics of HAL libraries
3.2 Proficient in the use process of STM32CubeMX software
3.3 Proficient in program writing and program download methods of MDK software

4. Use of MDK-ARM software

4.1 Proficient in the use of MDK_ARM software
4.2 Proficient in MDK_ARM software debugging methods
4.3 Understand the MDK_ARM software RTE environment

5. Universal input and output interface

5.1 Master the development of programs based on library functions
5.2 Understand the design ideas of library functions
5.3 Master the design ideas and implementation methods of the hardware abstraction layer

6. Interrupt overview

6.1 Master the basic concept and role of interruption
6.2 Understand the interrupt handling flow of HAL libraries
6.3 Proficient in programming using external interrupts

7. Timer

7.1 Understand the functions and characteristics of the timer
7.2 Understand the peripheral module design method of HAL library

7.3 Proficient in the timing function of the timer
7.4 Proficient in the PWM output and input capture functions of the timer

8. Serial communication

8.1 Understand the basic concepts of communication
8.2 Understand the peripheral initialization data idea of HAL library
8.3 Proficient in serial communication programming methods in three ways

Course Code: IOT-342	T	P	C
Course Title: **Application Development of IoT**	**1**	**3**	**2**

Application development of IoT is a professional core course, which adopts project-oriented, task-driven and other teaching methods, aiming to train students to master the basic principles and application development of Android technology, and use Android, Wireless sensor network, Database and other key technologies to complete the design, development, integration testing and maintenance of IoT application projects.Therefore, Students will have good abilities to development and implement IoT application projects.

Course Objectives

At the end of the course the students are expected to be able to

- Master the basic knowledge of Android system and Android program framework
- Master Android interface design knowledge
- Master the basic knowledge of Activity
- Master the basic knowledge of Android components
- Master the data transfer between activities and Master event handling methods in Android
- Have the ability to build Android development environment and use Android widgets
- Android application development ability, such as familiar with system controls, animation, multithreading, network protocol, database, XML/JSON parsing, etc.

COURSE OUTLINE

Contents	***Hours***
1. Fundamentals of android application development 1.1. Introduction to Android Development and Platform 1.2. Building Android Development Environment 1.3. Android Studio Usage and Android Program Structure Introduction 1.4. The first Android program —Hello World	**4**
2. User Interface(UI) layout 2.1. Android LinearLayout 2.2. Android RelativeLayout 2.3. Android GridLayout 2.4. Android TableLayout 2.5. Android ConstraintLayout, FrameLayout,AbsoluteLayout	**2**
3. Android widgets and styles 3.1. Android form widgets	**6**

3.1.1. TextView
3.1.2. EditText
3.1.3. Button and ImageButton
3.1.4. ImageView
3.1.5. RadioButton and CheckBox
3.1.6. ToggleButton and Switch
3.1.7. ProgressBar,SeekBar and RatingBar

3.2. Android basic widgets

3.2.1. Toast
3.2.2. AlerDialog
3.2.3. ScrollView
3.2.4. Adapter basic
3.2.5. ListView
3.2.6. GridView and Spinner

3.3. Android advanced widgets

3.3.1. DatePicker and TimePicker
3.3.2. Menu,Toolbar
3.3.3. ViewPager
3.3.4. ViewFilpper

3.4. Resources and styles

4. Fundamentals of Activity Component **4**

4.1. Activity basis
4.2. Intent basis
4.3. Data transmission in Intent
4.4. Event processing
4.4.1. Event processing mechanism based on Listener
4.4.2. Event processing mechanism based on Callback function
4.5. Mechanism of Handler message transfer

5. Fragment Application **4**

5.1. Fragment basis
5.2. Fragment dynamic loading
5.3. Fragment application cases

6. Data storage **4**

6.1. File storage
6.2. SharedPreferences storage
6.3. SQlite Database storage

7. Network programming **4**

7.1. Http protocol
7.2. HttpURLConnection
7.3. Socket communication
7.4. Network data transmission format
7.4.1. XML data
7.4.2. JSON data

8. **The other three components** **4**
   8.1. Service
   8.2. BroadcastReceiver
   8.3. ContentProvider

Total Hours:	***32***

References

- **Operating System Concepts, 5Ed**., A. Silverschatz and P. Galvin, Addison-Wesley Publishing Co.
- **Application development of IoT based on Android ,** Zhongzhi Liao, Hua Wang, et al, Tsinghua University Press.
- **Development of IoT mobile applications,** Yunfeng Ji, Li Liu, et al. Mechanical Industry Press.
- **Android mobile application basic tutorial (Android Studio) ,** Dark horse programmer, China Railway Press.
- **Application program development of IoT based on Android,** Jiaozhan, et al, Machinery Industry Press,China.

IOT-342 LIST OF PRACTICAL

1. Build the Android system environment
2. Create and run Android Studio
3. Environment status value range setting interface development
4. Shopping information storage interface development
5. Flame monitoring interface development
6. Camera monitoring interface development
7. User registration interface development
8. Query shopping information interface development
9. Smart city main interface development
10. Agricultural greenhouse environment monitoring interface development
11. Implement login function
12. The life cycle of the main page
13. Beat code shopping function called
14. The setting of intelligent agricultural environmental data
15. Entry of shopping information
16. Shopping information query
17. The camera screenshot is stored
18. Real-time display of temperature and humidity in agricultural greenhouses
19. Fan control in agricultural greenhouses
20. Lighting control in agricultural greenhouses
21. Transmission of flame alarm information
22. The terminal remotely controls the camera
23. Verify user login information

IOT 342 – Application development of IoT

INSTRUCTIONAL OBJECTIVES

1. Fundamentals of android application development

1.1. Master Android Development and Platform
1.2. Building Android Development Environment
1.3. Android Studio Usage and Android Program Structure Introduction
1.4. The first Android program —Hello World

2. User Interface(UI) layout

2.1. Master Android LinearLayout
2.2. Master Android RelativeLayout
2.3. Master Android GridLayout
2.4. Master Android TableLayout
2.5. Understand Android ConstraintLayout, FrameLayout,AbsoluteLayout

3. Android widgets and styles

3.1. Focus on the use of Android form widgets
3.2. Master the use of Android basic widgets
3.3. Familiar with the use of Android advanced widgets
3.4. Proficient in operating resources and styles
3.5. Proficient in using combination or hybrid applications of UI widgets
3.6. Master the generation and creation of advanced UI widgets ,such as ListView and GridView, as well as three types of Adapter data rendering

4. Fundamentals of Activity Component

4.1. Master the basic concepts and lifecycle of Activity
4.2. Master the implementation of interface jump function
4.3. Master the basic concepts of Intent
4.4. Master the implementation of data transfer function between interfaces
4.5. Proficient in using three types of event Listener methods
4.6. Master various callback methods of Activity lifecycle

5. Fragment Application

5.1. Understand the use of the sideslip menu,
5.2. Master the basic concept of Fragment and the characteristics of static load and dynamic load;
5.3. Know how to create a slidermenu,
5.4. Knows how to use a Fragment, can pass data between Activity and Fragment, can use a Viewpage component

6. Data storage

6.1. Understand the basic content and operation of file storage
6.2. Master the basic content and operation of SharePreference storage

6.3. Master the usage scenarios of SharePreference storage, such as remembering accounts, passwords, etc
6.4. Proficient in mastering the basic concepts of Android SQLite databases
6.5. Focus on creating Android SQLite databases and understand the basic operations of Android SQLite databases

7. Network programming

7.1. Understand the operation mechanism of Handler
7.2. Master the basic concepts of Android network programming
7.3. Master common network data formats, such as JSON,XML
7.4. Understand the characteristics of common network frameworks;
7.5. Objects that can use Handler
7.6. Can access the network using Http protocol
8.4. Can use HttpURLConnection, Socket to access the network

8. **The other three components**

8.1. Know the basic concepts of service, broadcast receiver, content provider
8.2. Master the common system broadcast, broadcast application scenarios
8.3. Understand the life cycle of services and the difference between services and threads
8.4. Can send notifications, can send and receive broadcasts, can use services

Course Code: **IOT-351**	**T**	**P**	**C**
Course Title: Practical Project of IoT	**0**	**3**	**1**

Practical Project of IoT is a comprehensive practice course with C language as the development language, which mainly includes the storage environment monitoring system, intelligent security system, production line environment monitoring system and other design projects.

Course Objectives

At the end of the course the students are expected to be able to

- Master the development process of the Internet of Things projects.
- Master the requirements description, system design, test report and other relevant document writing knowledge.
- Master the knowledge of front-end and background development, testing and maintenance.
- Capable of Internet of Things project planning, demand analysis and system design.
- Have the ability of Internet of Things project development and system operation.
- Cultivate the spirit of craftsmanship and innovative thinking.

References

- **Sensor network application development**, Jixin Chen, et al., Machinery Industry Press
- **Comprehensive application training of the Internet of Things**, Yannan Yin, et al., Machinery Industry Press
- **Comprehensive practical training of the Internet of Things**, Bo Zhang, Beijing University of Posts and Telecommunications Press Co., Ltd

IOT-351 LIST OF PRACTICAL

Equipment list: NEWLAB training platform, STM32 Main control board, ZigBee development board, NB-IoT module, WiFi module, Bluetooth module, Sensor kit, Intelligent gateway, Sensor network application development consumables package.

1. Temperature and humidity were collected using the ZigBee module
2. Flame values were collected using the ZigBee module
3. ZigBee Node networking
4. The mesh joint point receives the sensor data from the acquisition node
5. Sensor data reporting gateway
6. The cloud platform displays the sensor data
7. Collect the combustible gas data using the STM32 module
8. Flame values were collected using the STM32 module
9. Establish the RS-485 network
10. Select the modbus as the communication protocol
11. The host machine requests the sensor data from the slave machine
12. The slave sends the sensor data to the host machine via the RS-485 bus
13. The host machine sends the sensor data to the gateway
14. Log on to the cloud platform and view the sensor data
15. Temperature, humidity, and flame values were collected using the STM32 module
16. Build up the CAN network
17. The network joint point receives the sensor data from the terminal node
19. The network node sends the sensor data to the gateway
20. Log on to the cloud platform and view the sensor data

IOT-351 – Practical Project of IoT

INSTRUCTIONAL OBJECTIVES

1. Design of Intelligent Storage Environment Monitoring System

1.1. Can collect the temperature, humidity, flame value and other sensor data
1.2. Ability to build a network using the ZigBee
1.3. Can complete the functional design of ZigBee pooling nodes
1.4. Can send the sensor data to the gateway
1.5. Can log in to the cloud platform account and view the sensor data

2. Intelligent Security System Design

2.1. Framable gas and flame acquisition nodes can be designed based on the STM32 module
2.2. Can form an RS-485 network
2.3. Can complete the design of the host functions
2.4. Ability to send sensor data from the host to the gateway
2.5. Be able to log into the cloud platform and view the sensor data

3. Design of Production Line Environment Detection System

3.1. The terminal node function can be designed based on the stm 32 module
3.2. Can form a CAN network
3.3. Can design the function of the mesh joint point
3.4. Ability to send data from the network points to the gateway
3.5. Be able to log into the cloud platform and view the sensor data

Course Code: IOT-363	**T**	**P**	**C**
Course Title: **Post Practice**	**0**	**9**	**3**

Post Practice is professional core courses, to serve for the training objectives of the core competence of IoT application technology major, after completing the previous continuation course, students are required to complete the final professional internship. The course both meet the requirements of the professional standards, and intensive training of professional students, make this professional students understand the society in advance, enhance the post consciousness and post sense of responsibility, maximize the students' comprehensive quality, make students realize the happiness of work, so as to establish the idea of pride in labor and shame on laziness. Prepare themselves mentally, physically and mentally for employment, improve the employability of students.

Course Objectives

At the end of the course the students are expected to be able to

- Understand the overview of the internship unit.
- Familiar with the job content and ability requirements.
- Participate in the in-post internship of Internet of Things programmer, software tester, technology implementation and other positions.
- By participating in the company's project development, apply professional knowledge and skills to complete tasks.
- Adapt to the working environment, and correctly handle the interpersonal relationship in the working environment.
- Cultivate students' ability to find and solve problems.

IOT-363 LIST OF PRACTICAL

1. Guide students to use the knowledge they have learned to work in the perceptual control development of Internet of things, Internet of Things application development, Internet of Things application system design and development, and development of Internet of Things engineering operation and maintenance, etc

2. Urge students to work with the post practice

3. The instructors of both parties shall carry out on-site technical guidance, special practice or job rotation practice, collect relevant materials, understand the organization of the internship unit, participate in the business process of the internship unit, understand the business processing process of the internship unit, and draw the data flow chart of the main business

4. Familiar with various technical specifications, work requirements, systems and policies in the current application field of the Internet of Things, and adapt to the work requirements of future positions

5. According to the requirements of internship, sign in every day, write internship notes every week, and complete the related work of post internship

6. Submit the internship agreement, internship summary report, evaluation and appraisal and other required tasks

IOT-363 – Post Practice

INSTRUCTIONAL OBJECTIVES

1. Flexible use of the learned theoretical knowledge to solve practical problems

2. Ability to analyze and solve problems independently

3. Master the basic methods of project design, implementation and management of IoT

4. Understand the current national standards for the design, implementation and management of Internet of Things projects, and further improve professional practical skills

5. Have a strong independent learning ability and innovation ability

6. Enhance social adaptability and employability

7. Understand the society, familiar with the whole process of enterprise production and business activities

8. Enhance the understanding of professional positions, and lay the foundation for the related professional work after graduation

Proposed Minimum Qualification of Teacher/ Instructor

- **M.Sc./ Master in Computer Science with 2-Years' relevant experience in teaching/ industry**

OR

- **B.Sc. in Computer/Software Engg. with 2-Years' relevant experience in teaching/ industry**

OR

- **B.Sc. in Electrical/ Electronics/Telecom Engg/Mechatronics. with 2-Years' relevant experience in teaching/ industry**

OR

- **DAE in Computer Information Technology/DAE Mechatronics/ Electrical/ Electronics/ Telecom. with 6-Years' relevant experience in teaching/ industry**

EMPLOYABILITY OF GRADUATES

IoT is an ever changing field. The number of IoT nodes are increasing each day and hence their monitoring, upgrading and security needs. Therefore, industry requirement for skilled workforce is increasing which can only be managed through setting relevant competency standards in collaboration with the leading industries.

This course carries much value and recognized in the private, semi government and government sector as well as abroad for jobs as:-

- IoT Cloud Developer
- IoT Data Scientist
- Embedded Development Engineer
- Assistant Network Administrator in IoT Platform
- Android Development Engineer
- Data-Base Assistant
- IoT System Operations Engineer
- Freelancer on Fiver & up-work platform

Companies/Organizations Offering Jobs in the IoT Technology

International Companies:-

- Google
- Intel
- Microsoft
- Cisco and juniper networks
- Apple
- Samsung
- Sky bell
- Mymdband
- Deaco and many more…

Besides overseas employment, the following Pakistani companies/firms/Organizations are also offering jobs:

- NLC Smart Solutions
- IOTA Pakistan Pvt. Ltd
- Sky Electric
- NIDA
- EWall
- Arduino Pak
- PLC
- SDSol Technologies
- IoT developers systems Limited, Lahore
- DPL Islamabad
- Sync & Secure, Lahore
- Cross Analytics, Islamabad
- SDSol Technologies
- Digital Dividend
- Technosoft Solutions
- Datum Brain
- Internet of Things and Automation Pakistan Pvt. Ltd

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