CURRICULUM
DIPLOMA
Engineering All

First Year (First and Second Semester)

Council for Technical Education and Vocational Training (CTEVT)
Curriculum Development and Equivalence Division
Sanothimi, Bhaktapur
2021

Table of Contents

Introduction

The first year (First and Second Semester) curriculum is designed for all 3-years Engineering programme of Diploma level. In these curriculum foundational subjects such as Nepali, English, Mathematics, Physics, Chemistry and Computer Application are offered to build the academic base. The disciplinary subjects such as Engineering Drawing, Workshop Practice and Applied Mechanics are included in order to lure them to their respective field. Most of the subjects offered in first year (First and Second Semester) are of theoretical nature with some lab practices in basic science & applied mechanics. Practical exercises have been included in computer application, workshop practice and engineering drawing to provide them the practical exposure. The first-year courses fulfil the academic requirements to enter bachelor degree in engineering.

Entry Criteria

- SLC Pass or SEE with minimum C grade in Compulsory Mathematics & Science and D+ in English.
- Pre-diploma in Civil Engineering with minimum 67.00%.
- Should pass entrance examination administered by CTEVT.

Medium of Instruction

The medium of instruction will be in English and/or Nepali.

Pattern of Attendance

Minimum of 90% attendance in each subject is required to appear in the respective final examination.

Teachers and Students Ratio

The ratio between teachers and students must be:

- Overall ratio of teacher and student must be 1:12 (at the institution level)
- 1:48 for theory and tutorial classes
- 1:12 for lab, practical/demonstration
- 1:6 for bench work
- 75 % of the technical teachers must be full timer

Qualification of Teachers and Instructors

- The program coordinator should be a master's degree holder in the related area.
- The disciplinary subject related teacher and demonstrators should be a bachelor’s degree holder in the related area.
- The foundational subject related teacher (refer to course code SH and MG) should be master’s degree holder in the related area.

Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- ***Printed Media Materials*** (Assignment sheets, Hand-outs, Information sheets, Individual training packets, Procedure sheets, Performance check lists, Textbooks etc.).
- ***Non-projected Media Materials*** (Display, Flip chart, Poster, Writing board etc.).
- ***Projected Media Materials*** (Opaque projections, multimedia, Slides etc.).

- ***Computer-Based Instructional Materials*** (Computer-based training, Interactive video etc.)

Teaching Learning Methodologies

The methods of teachings for this curricular program will be a combination of several approaches such as; lecture, illustrated talk, tutorial, group discussion, demonstration, simulation, guided practice, self-practice, fieldwork, block study, industrial practice, report writing, term paper presentation, heuristic and other independent learning exercises.

Theory: Lecture, discussion, assignment, interaction, seminar, group work.

Practical: Demonstration, observation, simulation, guided practice, self-practice, industrial practice and project work.

Mode of Education

There will be inductive and deductive mode of education.

Examination and Marking Scheme

a. Internal assessment

- There will be a transparent/fair evaluation system for each subject both in theory and practical exposure.
- Each subject will have internal assessment at regular intervals and students will get the feedback about it.
- Weightage of theory and practical marks are mentioned in course structure.
- Continuous assessment format will be developed and applied by the evaluators for evaluating student's performance in the subjects related to the practical experience.

b. Final examination

- Weightage of theory and practical marks are mentioned in course structure.
- Students must pass in all subjects both in theory and practical for certification. If a student becomes unable to succeed in any subject, s/he will appear in the re-examination administered by CTEVT.
- Students will be allowed to appear in the final examination only after completing the internal assessment requirements.

c. Requirement for final practical examination

- Professional of relevant subject instructor must evaluate final practical examinations.
- One evaluator in one setting can evaluate not more than 24 students.
- Practical examination should be administered in actual situation on relevant subject with the provision of at least one internal evaluator from the concerned or affiliating institute led by external evaluator nominated by CTEVT.
- Provision of re-examination will be as per CTEVT policy.

d. Final practicum evaluation will be based on:

- Institutional practicum attendance - 10%
- Logbook/Practicum book maintenance - 10%
- Spot performance (assigned task/practicum performance/identification/arrangement preparation/measurement) - 40%
- Viva voce:
  - Internal examiner - 20%
  - External examiner - 20%

e. Pass marks:

- The students must secure minimum 40% marks in theory and 50% marks in practical. Moreover, the students must secure minimum pass marks in the internal assessment and in the semester final examination of each subject to pass the subject.

Provision of Back Paper

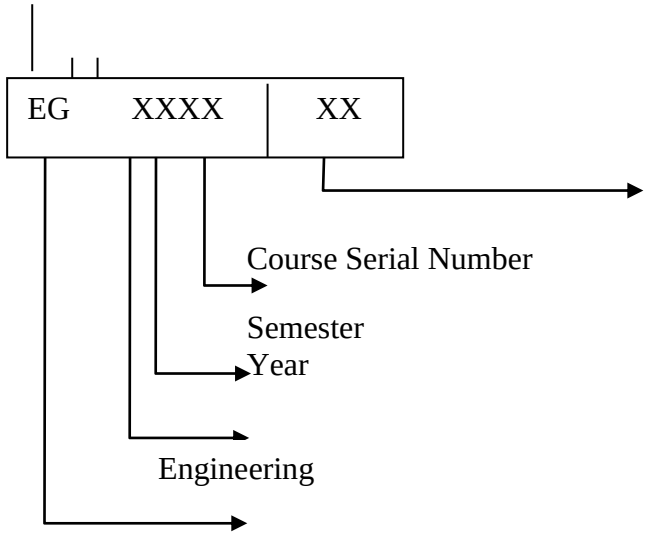
There will be the provision of back paper but a student must pass all the subjects of all semester within six years from the enrollment.

Disciplinary and Ethical Requirements

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by the review of the disciplinary review committee of the institute.
- Dishonesty in academic or practical activities will result in immediate suspension followed by administrative review, with possible expulsion.
- Illicit drug use, bearing arms in institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

Subjects Codes

Each subject is coded with a unique number preceded and followed by certain letters as mentioned in following chart:



Offering Departments:

AE: Agricultural Engineering

AR: Architecture

CE: Civil Engineering

CT: Computer Engineering

EE: Electrical Engineering

EX: Electronics Engineering

HE: Hydropower Engineering
ME: Mechanical Engineering

MG: Management
SH: Science and Humanities

Course Structure:

YEAR: I **SEMESTER I**

S.N.	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
								Theory			Practical				
			L	T	P	Lab		Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	1101 SH	Nepali	4				4	20	80	3				100	*Continuous assessment
2	EG 1102 SH	Applied English	4				4	20	80	3				100	
3	EG 1103 SH	Engineering Mathematics I	4	2			6	20	80	3				100	
4	EG 1104 SH	Engineering Physics I	4	2		2	8	20	60	3	10	10	2	100	
5	EG 1105 SH	Engineering Chemistry I	4	2		2	8	20	60	3	10	10	2	100	
6	EG 1101 AR	Engineering Drawing I	1		4		5	0	0		60	40	4	100	
7	EG 1101 CT	Computer Application	2		2		4	10	40	1.5	30	20	3	100	
TOTAL			**23**	**6**	**6**	**4**	**39**	**110**	**400**		**110**	**80**		**700**	

YEAR: I **SEMESTER II**

S.N.	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
								Theory			Practical				
			L	T	P	Lab		Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	EG 1201 SH	Engineering Mathematics II	4	2			6	20	80	3				100	*Continuous assessment
2	EG 1202 SH	Engineering Physics II	4	2		2	8	20	60	3	10	10	2	100	
3	EG 1203 SH	Engineering Chemistry II	4	2		2	8	20	60	3	10	10	2	100	
4	EG 1201 CE	Workshop Practice I	2		6		**8**	0	0		60	40	4	100	
5	EG 1201 AR	Engineering Drawing II	0		4		4	0	0		60	40	4	100	
6	EG 1202 CE	Applied Mechanics	3	2		2/2	6	20	60	3	20	0		100	
TOTAL			**17**	**8**	**10**	**5**	**40**	**80**	**260**		**160**	**100**		**600**	

First Year
[First and Second Semesters]

First Semester

Subjects:

1	1101 SH	Nepali
2	EG 1102 SH	Applied English
3	EG 1103 SH	Engineering Mathematics I
4	EG 1104 SH	Engineering Physics I
5	EG 1105 SH	Engineering Chemistry I
6	EG 1101 AR	Engineering Drawing I
7	EG 1101 CT	Computer Application

नेपाली

११०१ एस.एच.

वर्षः प्रथम | जम्माः ४ घण्टा/हप्ता
खण्डः प्रथम | प्रवचनः ४ घण्टा/हप्ता

कोर्षको परिचयः

यस विषयमा विद्यार्थीहरूले भावी व्यावसायमा प्रभावकारी ढङ्गले सञ्चार गर्नका लागि आवश्यक पर्ने ज्ञान र सीपसँग सम्बन्धित नेपाली सञ्चारात्मक भाषा, लेखन सीप अन्तर्गतका शीर्षक र कृति परिचयको ढाँचा गरी जम्मा ८ वटा एकाइहरू समावेश गरिएका छन्।

कोर्षको उद्देश्यः

यस पाठ्यांशको अध्ययनबाट विद्यार्थीहरूले निम्न लिखित भाषिक क्षमता विकास गर्न सक्नेछन्:-

१. आफ्नो व्यावसायिक कार्य क्षेत्रमा प्रभावकारी सञ्चार गर्न
२. आफ्नो व्यावसायसँघ सम्बन्धित विविध लेखन सीप प्रदर्शन गर्न
३. कार्य सम्पादनमा आवश्यक परिस्थितिजन्य संवाद गर्न।

एकाइ १: संचारात्मक नेपाली भाषा र नेपाली व्याकरण — **१४ घण्टा**

१.१ भाषिक भेदको परिचय — **३ घण्टा**

- मौखिक र लिखित
- औपचारिक र अनौपचारिक
- अमानक र मानक
- सामान्य र प्रयोजनपरक (विशिष्ट) भेदको सोदाहरण परिचय

१.२ वर्णको परिचय — **२ घण्टा**

- नेपाली वर्णहरूको पहिचान
- ध्वनि र वर्ण
- स्वर वर्ण
- व्यञ्जनवर्ण

१.३ वर्ण विन्यास — **२ घण्टा**

- ह्रस्व र दीर्घ हुने नियम
- हलन्त र अजन्तको प्रयोग सम्बन्धी नियम
- शिरबिन्दु र चन्द्रबिन्दु सम्बन्धी नियमहरू
- पदयोग र पद वियोग सम्बन्धी नियम
- लेख्य चिह्नहरुको परिचय र प्रयोग सम्बन्धी नियमहरू

१.४ शब्द भण्डार — **३ घण्टा**

- स्रोतका आधारमा शब्दको वर्गीकरण
- बनोटका आधारमा
- कार्यका आधारमा

१.५. शब्द रूपायन — **२ घण्टा**

- रूपायनको परिचय
- नामको रूपायन
- सर्वनामको रूपायन
- विशेषणको रूपायन
- क्रियापदको रूपायन

१.६ वाक्य संश्लेषण र वाक्य विश्लेषण — **१ घण्टा**

- वाक्य संश्लेषण
- वाक्यविश्लेषण

१.७ पदसङ्गति — **१ घण्टा**

- पदसङ्गतिको परिचय
- पदसङ्गतिका प्रकार

एकाइ दुईः लेखन सिप **२२ घण्टा**

२.१ लेखन सिप **६ घण्टा**

- बोधको ज्ञान र अभ्यास

२.२ लेखन सिप **३ घण्टा**

- बुँदाटिपोट
- सारांश लेखन

२.३ लेखन सिप **३ घण्टा**

- संवाद लेखन
- अनुच्छेद लेखन

(कुनै एक)

२.४ लेखन सिप **४ घण्टा**

- निमन्त्रणापत्र
- सूचना
- सम्पादकलाई चिट्ठी
- निवेदन
- विज्ञापन
- बधाई ज्ञापन

(कुनै एक)

२.५ लेखन सिप **४ घण्टा**

- निबन्ध लेखन

२.६ लेखन सिप **२ घण्टा**

- प्रतिवेदन लेखन

एकाइ ३ः कृति/पाठ परिचय र कृति समीक्षा **२४ घण्टा**

३.१ निम्नलिखित ढाँचामा तलका कृति/पाठको परिचय लेख्ने अभ्यास **६ घण्टा**

क) कृतिहरूः

- म कसरी हार्छु (नाटक) गोविन्दबहादुर मल्ल गोठाले
- माइतघर (उपन्यास) लैनसिंह वाङ्देल
- राष्ट्रनिर्माता (खण्डकाव्य) माधवप्रसाद घिमिरे

ख) कृति परिचयको ढाँचा

- कृति/पाठको नामः
- कृति/पाठको रचनाकारको नामः
- कृति/पाठको मुख्य विषयः (एक अनुच्छेद)
- कृति/पाठको महत्वः (एक अनुच्छेद)
- कृति/पाठले आफूलाई पारेको प्रभावः (छोटो एक अनुच्छेद)
- कृति/पाठको भाषाशैलीः (छोटो एक अनुच्छेद)
- कृति/पाठको कमी, कमजोरी र सुझावः (छोटो एक अनुच्छेद)

३.२ कृति समीक्षा **१८ घन्टा**

क) कथाखण्ड **५ घण्टा**

- हरिदत्तः विश्वेश्वरप्रसाद कोइराला
- बितेका कुराः रुपनारायण सिंह
- मृगतृष्णाः माया ठकुरी

ख) निबन्ध खण्ड **५ घण्टा**

- पहाडी जीवनः लक्ष्मीप्रसाद देवकोटा

- एक पत्र— सम्पादकलाईः शङ्कर लामिछाने
- भान्सा भो हजुरः भैरव अर्याल

ग) कविता खण्ड **४ घण्टा**

- साहित्य सुधाः धरणीधर कोइराला
- हामीः भूपी शेरचन
- नचिनिने भएछौः अगमसिंह गिरी

घ) एकाङ्की **४ घण्टा**

- भावनाः भीमनिधि तिवारी

सिकाइ सामग्रीहरू

- कृष्णप्रसाद पराजुलीः राम्रो रचना मीठो नेपाली, सहयोगी प्रेस
- दयाराम श्रेष्ठ र मोहनराज शर्माः नेपाली साहित्यको सङ्क्षिप्त इतिहास, साझा प्रकाशन
- डा. मोहन बिक्रम थापाः साहित्य परिचय, साझा प्रकाशन
- विश्वेश्वरप्रसाद कोइरालाः दोषी चस्मा कथा सङ्ग्रह, साझा प्रकाशन
- माधवप्रसाद घिमिरेः राष्ट्र निर्माता खण्डकाव्य, साझा प्रकाशन
- लैनसिंह वाङ्देलः माइतघर उपन्यास, रत्न पुस्तक भण्डार
- गोविन्दबहादुर मल्ल गोठालेः भोको घर एकाङ्की सङ्ग्रह, साझा प्रकाशन
- व्यावहारिक नेपाली, टीकाहरि बराल, अस्मिता बुक्स पब्लिसर्स एण्ड डिस्ट्रिब्युटर्स प्रा.लि.पुतलीसडक काठमाडौं
- गोरखापत्र, कान्तिपुर आदि पत्रिका सम्पादकीय, टिप्पणी र लेखहरू
- प्रशिक्षकहरूले आफ्नो पुस्तक तयार गर्न वा बजारमा पाइने सामग्री छानेर पढाउन सक्ने

विशिष्टीकरण तालिका

एकाइ	शीर्षक	समय	पूर्णांक
१	**संचारात्मक नेपाली भाषा र नेपाली व्याकरण**	**१४ घण्टा**	**पूर्णाङ्क (२४)**
	१.१ भाषिक भेदको परिचय	३ घण्टा	पूर्णाङ्क (४)
	१.२ वर्णको परिचय	१ घण्टा	पूर्णाङ्क (२)
	१.३ वर्णविन्यास	३ घण्टा	पूर्णाङ्क (४)
	१.४ शब्द भण्डार	३ घण्टा	पूर्णाङ्क (२)
	१.५ शब्द रुपायन	२ घण्टा	पूर्णाङ्क (४)
	१.६ वाक्य संश्लेषण र वाक्य विश्लेषण	३ घण्टा	पूर्णाङ्क (४)
	१.७ पदसङ्गति	३ घण्टा	पूर्णाङ्क (४)
२	**लेखन सीप**	**२२ घण्टा**	**पूर्णाङ्क (३२)**
	२.१ लेखन सीप (बोधको ज्ञान)	६ घण्टा	पूर्णाङ्क (८)
	२.२ लेखन सीप (बुँदा लेखन, सारांश लेखन)	३ घण्टा	पूर्णाङ्क (४)
	२.३ लेखन सीप (संवाद लेखन, अनुच्छेद लेखन)	३ घण्टा	पूर्णाङ्क (४)
	२.४ लेखन सीप (निमन्त्रणा पत्र, सूचना, सम्पादकलाई चिठ्ठी, निवेदन, विज्ञापन, बधाई ज्ञापन)	४ घण्टा	पूर्णाङ्क (४)
	२.५ लेखन सीप (निबन्ध लेखन)	४ घण्टा	पूर्णाङ्क (८)
	२.६ लेखन सीप (प्रतिवेदन लेखन)	२ घण्टा	पूर्णाङ्क (४)
३	**कृति/पाठको परिचय लेख्ने अभ्यास**	**२४ घण्टा**	**पूर्णाङ्क (२४)**
	३.१ कृति/पाठको परिचय लेख्ने अभ्यास	६ घण्टा	पूर्णाङ्क (८)
	३.२ कृति समीक्षा	१८ घण्टा	पूर्णाङ्क (१६)
	क. कथा खण्ड	५ घण्टा	पूर्णाङ्क (४)
	ख. निवन्ध खण्ड	५ घण्टा	पूर्णाङ्क (४)
	ग. कविता खण्ड	४ घण्टा	पूर्णाङ्क (४)
	घ. एकाङ्की	४ घण्टा	पूर्णाङ्क (४)

Applied English
EG 1102 SH

Year: I **Total: 4 hours /week**
Semester: I **Lecture: 4 hour/week**
Practical: hours/week

Course Description:
This course is designed with a view to provide students techniques in using English for academic and communicative purposes, train them in the comprehending varieties of texts, terminologies, grammatical and communicative areas of English language, make them see the relationship between structure and meaning. This guides the students from general to comprehensive understanding of language.

Course Objectives:
On completion of the course the students will be enabled to:

1. Construct sensible sentences applying the grammatical structures.
2. Answer the questions given after the comprehension passage.
3. Use terminologies vocabularies to construct sensible sentences.
4. Conduct a dialogue in given situation.
5. Write paragraphs on people, place and events correctly and meaningfully.
6. Analyze the literary texts.

Section One: Language Development **[40 Hrs.]**

Unit 1: Technology **[4 Hrs.]**

1.1 Reading comprehension: Hyper loop
  1.1.1 Use of technological terms
  1.1.2 Use of prefixes
  1.1.3 Question- answer
1.2 Issuing a press release
1.3 Subject Verb agreement
1.4 Summarizing
1.5 Project Work

Unit 2: Money and Economy **[4 Hrs.]**

2.1 Reading comprehension: QR Code
  2.1.1 Use of terminologies
  2.1.2 Abbreviations
  2.1.3 Vowel sounds
  2.1.4 Question- Answer
2.2 Writing a news article
2.3 Questions:
  2.3.1 Yes/no questions
  2.3.2 Wh - questions
  2.3.3 Indirect and direct questions
2.4 Expressing necessity
2.5 Project Work

Unit 3: Human Culture **[4 Hrs.]**

3.1 Reading Comprehension: Land of Plenty
  3.1.1 Word Formation: Root, Prefixes and prefixes

3.1.2 Question-answer
3.2 Writing:
3.2.1 Paragraph
3.2.2 Letter to the editor
3.3 Adjectives and Adverbs
3.4 Making comparison and contrast
3.5 Project Work

Unit 4: Ecology and Environment **[4 Hrs.]**

4.1 Reading Comprehension: Living in a Redwood Tree
4.1.1 Terminologies used in ecology
4.1.2 Compound words
4.1.3 Question - answer
4.2 Writing a book/film review
4.3 Reported Speech
4.4 Reporting
4.5 Project Work

Unit 5: Career Opportunities **[4 Hrs.]**

5.1 Reading Comprehension: Presenting Yourself
5.1.1 Employment-related terminologies
5.1.2 Answering questions
5.2 Writing job application with CV
5.3 Conditional Sentences
5.4 Clarifying
5.5 Project Work

Unit 6: Human Rights **[4 Hrs.]**

6.1 Reading Comprehension: "I am Sorry"- The Hardest Three Words to Say
6.1.1 Word formation
6.1.2 Question-answer
6.2 Writing Paragraphs on Steps on making education equal
6.3 Connectives
6.4 Group work: Criticizing
6.5 Project Work

Unit 7: War and Peace **[4 Hrs.]**

7.1 Reading comprehension: Train to Pakistan
7.1.1 Terminologies
7.1.2 Question -answer
7.1.3 Vowels: Monophthongs and diphthongs
7.2 Describing People, place or event
7.3 Past simple, Past continuous, Past perfect, Past perfect continuous tense
7.4 Group work: Making Announcements
7.5 Project Work

Unit 8: Music and Creation **[4 Hrs.]**

8.1 Reading Comprehension: A Life of Sound and Silence
8.1.1 Terminologies used in music
8.1.2 Word Stress
8.1.3 Question -answer

8.2 Writing a bibliography.
8.3 Preposition of time
8.4 Group work: Predicting
8.5 Project Work

Unit 9: Migration and Diaspora **[4 Hrs.]**

9.1 Reading Comprehension: Dediasporization: Homeland and Hostland
- 9.1.1 Consonants: Voiced and voiceless sounds
- 9.1.2 Stressed an unstressed syllable
- 9.1.3 Question - answer

9.2 Interpreting data in charts and graphs
9.3 Would/ Used to
9.4 Narrating past events
9.5 Project Work

Unit 10: Power and Politics **[4 Hrs.]**

10.1 Reading Comprehension: An Open Letter to Mary Daly
- 10.1.1 Terminologies used in politics
- 10.1.2 Consonant cluster
- 10.1.3 Question- answer

10.2 Writing an article for a newspaper
10.3 Adjective order
10.4 Pair work: Denying
10.5 Project Work

Section Two: Literature **[20 Hrs.]**

Unit One: Short Stories

1. The Treasure in the Forest - H. G. Wells
2. My Old Home - Lu Xun
3. The Half-closed Eyes of the Buddha and the Slowly Sinking Sun -Shankar Lamichhane
4. A Very Old Man with Enormous Wings - Gabriel Garcia Marquez

Unit Two: Poems

1. The Awakening Age - Ben Okri
2. Soft Storm – Abhi Subedi

Unit Three: Essays

1. Knowledge and Wisdom - Bertrand Russell
2. Humility - Yuval Noah Harari
3. Human Rights and the Age of Inequality - Samuel Moyn

References:

1. Panday, Ram Kumar. *Yeti Tells.* SajhaPrakashan.3rd edition. Kathmandu, 2050.
2. Ancient Tales.Ed, Lohani, Shreedhar P, Adhikari Rameshwar P and Subedi, Abhi N. Educational Enterprises Pvt Ltd: Kathmandu,1996.
3. Grade 12 English. Centre for Curriculum Development, Government of Nepal: Sano Thimi, 2077.
4. Poudel, R.C., A Manual to Communicative English, K.P. Pustak Bhandar, Kathmandu, 1956/57.

5. Shah, B.L., A text book of writing skills in English, First edition Hira Books Enterprises, Kathmandu,
6. Fruehling, R. T. and Oldham N. B., Write to the point, McGraw- Hill, Inc. New York NY 10020
7. Taylor, G., English conversation practice, 1975.
8. Maharjan L. B., A textbook of English sounds and Structures, Vidyarthi Pustak Bhandar, Kathmandu,2000.
9. Blundell, Jon, Higgens, Jonathan & Middlemiss, Nigel, Function of English, Oxford University Press
10. Better English Pronunciation, Cambridge University Press, New edition
11. Link English, Central Department of English, Tribhuvan University
12. References to be selected by the related lecturer(s) from among the texts available in the market that meet the content needs of this subject.
13. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject.

Evaluation Scheme

Units	Title	Hours	Mark distribution*
Language Development			
1.	Technology	4	5
2.	Money and Economy	4	5
3.	Human Culture	4	5
4.	Ecology and Environment	4	5
5.	Career Opportunities	4	4
6.	Human Rights	4	5
7.	War and Peace	4	5
8.	Music and Creation	4	4
9.	Migration and Diaspora	4	5
10.	Power and Politics	4	5
Total		**40**	**48**
Literature			
1.	The Treasure in the Forest - H. G. Wells	3	7×2
2.	My Old Home - Lu Xun	3	
3.	The Half-closed Eyes of the Buddha and the Slowly Sinking Sun -Shankar Lamichhane	3	
4.	A Very Old Man with Enormous Wings - Gabriel Garcia Marquez	3	
5.	The Awakening Age - Ben Okri	1	6×1
6.	Soft Storm – Abhi Subedi	1	
7.	Knowledge and Wisdom - Bertrand Russell	2	6×2
8.	Humility - Yuval Noah Harari	2	
9.	Human Rights and the Age of Inequality - Samuel Moyn	2	
Total		**20**	**32**

Any four questions out of five groups should be attempted from literature.

Engineering Mathematics I
EG 1103 SH

Year: I **Total: 6 hours /week**
Semester: I **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: hours/week

Course Description:
This course consists of five units namely: Set and Function, Trigonometry, Calculus, Algebra, Coordinate Geometry; which are basically necessary to develop mathematical knowledge and helpful for understanding as well as practicing their skills in the related engineering fields.

Course Objectives:
On completion of this course, students will be able to understand the concept of the following topics and apply them in the related fields of different engineering areas:

- Ideas of real number system and functional relation between parameters
- Trigonometric equations, inverse circular functions and properties of triangles
- Progressions, permutations and combinations, binomial theorem, exponential and logarithmic series
- Straight lines, pair of lines and circle, Limit and continuity, derivatives and anti-derivatives

Course Contents:

Unit 1: Set, Functions and Graphs [7 Hrs.]

- Cardinality of set, Power set, Properties of set algebra, De Morgan's laws,
- Real number systems, intervals and absolute value
- Relations and Functions, idea of domain and range
- Types of functions, exponential and logarithmic functions with their graphs

Unit 2: Trigonometry [11 Hrs.]

2.1. Revision: Basic trigonometric formulae, Identities and conditional identities, Height and distance

2.2. Trigonometric Equations and Inverse Circular Functions

- General solutions of the equations of type Sin x= k, Cos x = k and Tan x = k
- Formulae involving inverse circular functions
- Simple identities and equations involving circular functions

2.3. Properties of Triangles

- The Sine, Cosine and projection laws (with proofs)
- The half angle formulae, Tangent laws and area of a triangle (without proofs)
- Simple cases on solution of triangles

Unit 3: Calculus [18 Hrs.]

3.1. Limit and Continuity

- Limit of functions, Indeterminate forms (only $\frac{0}{0}, \frac{\infty}{\infty}$ and $\infty - \infty$)
- Algebraic properties of limits (without proof)

- Theorems on limits (without proof)
- Continuity and discontinuity of function, types of discontinuity

3.2. Derivatives

- Definition, geometrical and physical meanings of derivative
- Derivatives from definition of simple functions like: x^n,$(ax+b)^n$, $sin\ (ax+b)$,e^{ax}, a^x and $log\ x$
- Rules of derivatives (sum, difference, product, quotient and chain rules)
- Derivatives of trigonometric, parametric and implicit functions
- Higher order derivatives

3.3. Integration

- Definition and notation, Basic rules of integration
- Fundamental integrals and Integration by substitution
- Integration by parts and Definite integrals

Unit 4: Algebra [12 Hrs.]

4.1. Progressions

- Arithmetic, Geometric and Harmonic Progressions
- Sum of infinite geometric series, Sum of First natural numbers
- Sum of squares and cubes of First n natural numbers (without proof)

4.2. Permutations and Combinations

- Principle of counting, Types of Permutation
- Combination and its properties (without proof)

4.3. The Binomial Theorem

- Binomial theorem (without proof)
- Expansion of binomial expressions, general terms, middle terms
- and terms free from variables
- Expansion of binominal expression for any index
- Expansion of exponential and logarithmic functions (without proof)

Unit 5: Coordinate Geometry [12 Hrs.]

5.1. Straight Lines

- Three standard forms of a line, general form: $ax + by + c = 0$, the line
- through the intersection of two lines, the concurrency of lines, area of triangle
- Angle between two lines, bisector of angle between two lines
- and length of perpendicular from a point on a line

5.2. Pair of Lines

- Homogeneous equation of second degree
- General equation of second degree representing two lines
- Angle between a pair of lines and bisectors of the angles for a line pair (without proof)
- Condition for general equation of second degree to represent a line pair (without proof)
- Lines joining the origin to the points of intersection of a curve and a line

5.3. The Circle

- Standard and central forms
- General and Diameter forms (without proof)
- Tangent and normal to the circle
- Condition of tangency of a straight line to a circle (without proof)

Tutorial **[30 Hrs.]**

1. **Set, function and graphs** **[2 Hrs.]**
2. **Trigonometry** **[5 Hrs.]**
   - Trigonometric Equations and Inverse Circular Functions [2 Hrs.]
   - Properties of Triangles [3 Hrs.]
3. **Calculus** **[10 Hrs.]**
   - Limit and Continuity [2 Hrs.]
   - Derivatives [4 Hrs.]
   - Integration [4 Hrs.]
4. **Algebra** **[7 Hrs.]**
   - Progressions [2 Hrs.]
   - Permutations and Combinations [2 Hrs.]
   - The Binomial Theorem [3 Hrs.]
5. **Coordinate Geometry [6 Hrs.]**
   - Straight Lines [2 Hrs.]
   - Pair of Lines [2 Hrs.]
   - The Circle [2 Hrs.]

Evaluation Scheme

Unit wise Marks division for Final

S. N.	Units	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Set, function and graphs	2x2=4	1x4=4	8
2	Trigonometry	3x2=6	2x4=8	14
3	Calculus	4 x 2 = 8	4 x 4 = 16	24
4	Algebra	3 x 2 = 6	3 x 4 = 12	18
5	Coordinate Geometry	2 x 2 = 4	3 x 4 = 12	16
		14 x 2 = 28	**13 x 4 = 52**	**80**

Reference Books

1.Thapa et al., Engineering Mathematics (Volume I, Three Years Diploma), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal

2. Bajracharya et al., Basic Mathematics (Grade XI/XII), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal

3. Nath et al., Engineering Mathematics I, Vidhyarthi Publisher and distributors, Bhotahity, Kathmandu, Nepal

4. Other references selected by the related lecturer(s) from among the texts available in the market that meet the content of this subject.

Engineering Physics I
EG 1104 SH

Year: I **Total: 8 hours /week**
Semester: I **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description

This course in physics is designed to provide students with an understanding of the scientific laws of our physical world, and how physics contributes to life's activities in modern society. The course emphasizes both quantitative and qualitative aspects of physics, involving mathematical models and equations. The application of physics to social and environmental situations is well illustrated.

The practical component of this course is designed to supplement learning through the application of learned theory. The students will handle simple apparatus to do simple measurements, demonstrate simple electrical circuits, and apply their knowledge of physics to real life examples.

Course Objectives

On completion of the course the student will be able to:

- Sustain interest in physics and its applications related to everyday experiences of their life
- Identify the social, economic, environmental and other implications of physics
- Describe physics as a coherent and developing framework of knowledge based on fundamental theories ofthe structures and processes of the physical world
- Demonstrate the skills of experimenting, observing, interpreting data and evaluating evidence to formulate generalizations and models
- Apply knowledge of physical principles to familiar and unfamiliar situations
- Apply facts, vocabulary and conventions to unit measurements and common measuring instruments
- Explain the definitions, laws, concepts, theories and models presented in this course.
- Describe the applications and implications of physical facts and principles.
- Explain the basic concept of Physics relevant to problems for the understanding
- and practicing related in engineering works.

Course content

Unit 1: Mechanics **[22 Hrs.]**

Sub-Unit 1.1: Units and Measurement **[2 Hrs.]**

- Physical concept of mass, length and time.
- Various systems of units and their conversion
- Derived units in terms of fundamental units.
- Precise and accurate measurement
- Dimensional formula for various physical quantities.
- Applications of dimensional equations.
- Simple Numerical Problems

Sub-unit 1.2: Scalars and Vectors **[3 Hrs.]**

- Scalars and vectors with examples.
- Resolution of a vector.

- Triangle and parallelogram law of vectors
- Multiplication of vectors
- Simple Numerical Problems

Sub unit 1.3: Kinematics **[2 Hrs.]**

- Revision of equations of motion
- Projectile motion
- Concepts of relative velocity
- Simple Numerical Problems

Sub-unit 1.4: Newton's Laws of motion **[2 Hrs.]**

- Newton's first, second and third laws of motion.
- Principle of conservation of linear momentum.
- Applications of inertia and impulse.
- Laws of solid friction, angle of friction and angle of repose
- Simple Numerical Problems

Sub unit1.5: Uniform circular Motion **[3 Hrs.]**

- Angular displacement and velocity
- Derivation of the relation $v = \omega r$.
- Vector nature of velocity and change thedirection of velocity in circular motion.
- Derivation of centripetal acceleration and force.
- Motion of a body in a vertical circle.
- Motion of cyclist and motion of vehicle in banked road
- Simple numerical problems

Sub-unit 1.6: Work, Energy and power **[3 Hrs.]**

- Definition and units of work, energy and power and its meaning in Physics
- Potential and kinetic energy.
- Work energy theorem.
- Conservation of energy i.e. change of KE into PEgiving example of freely falling body.
- Transformation of energy into different forms.
- Conservative and non-conservative forces.
- Simple numerical problems.

Sub-unit 1.7: Gravity and Gravitation **[3 Hrs.]**

- Newton's law of gravitation.
- Acceleration due to gravity and its variation due to height, depth and latitude
- Motion of satellites: Escape velocity, orbital velocity, geostationary satellite
- Weightlessness condition in a lift
- Simple numerical problems

Sub unit 1.8: Simple Harmonic Motion **[2 Hrs.]**

- Simple harmonic motion and its characteristics
- Time period, frequency, amplitude of simple harmonic motion
- Speed and acceleration in simple harmonic motion
- Energy of simple harmonic motion
- Simple pendulum and its time period
- Simple numerical problems

Sub unit 1.9: Rotation of Rigid bodies **[2 Hrs.]**

- Forces in equilibrium, center of gravity, center of mass
- Torque, work done by torque, couple
- Moment of inertia

- Angular momentum and its conservation
- Simple numerical problems

Unit 2: Heat and Thermodynamics [18 Hrs.]

Sub unit 2.1: Heat phenomena and Quantity of heat [3 Hrs.]

- Concepts of temperature and thermal equilibrium
- Different scales of temperature and their relations
- Quantity of heat gain and heat loss
- Specific heat capacity and its determination by method of mixture
- Newton's laws of cooling and its explanation
- Simple Numerical Problems

Sub unit 2.2: Change of Phase and Hygrometry [2 Hrs.]

- States of matter, fusion, vaporization, evaporation and boiling
- Determination of specific latent heat of fusion and vaporization
- Saturated and unsaturated vapors
- Variation of melting and boiling points with pressure
- Triple point, dew point and humidity
- Simple Numerical Problem

Sub unit 2.3: Thermal Expansion [3 Hrs.]

- Coefficients of linear, superficial and cubical expansion of a solid and relation between them
- Real and apparent expansions of liquids and their relation
- Variation of density due to change in temperature
- Simple Numerical Problems

Sub unit 2.4: Transfer of Heat [2 Hrs.]

- Methods of heat transfer
- Thermal conduction, conductivity and determination of thermal conductivity
- Radiation
- Black body and its practical realization
- Stefan's law of black body radiation
- Simple Numerical Problems

Sub unit 2.5: Gas Laws and Kinetic Theory of Gas [3 Hrs.]

- Boyle's law, Charle's law and ideal gas equations
- Universal gas constant, Avogadro's number and Boltzmann's constant
- Volume and pressure coefficients of ideal gas
- Pressure exerted by ideal gas according to kinetic theory
- RMS speed and mean energy of a molecule of an ideal gas
- Simple Numerical Problems

Sub units 2.6: Thermodynamics [5 Hrs.]

- First law of thermodynamics
- Thermodynamic processes: Isothermal, adiabatic, isobaric and isochoric
- Equation of adiabatic process.
- Work done in isothermal and adiabatic process.
- Specific and molar heat capacities at constant pressure and constant volume with their relation
- Second law of thermodynamics, working of ideal engine and refrigerator
- Simple Numerical Problems

Unit 3: Optics **[12 Hrs.]**

Sub unit 3.1: Reflection by plane surface **[2 Hrs.]**

- Laws of reflection
- Deviation produced by plane mirror
- Effect on reflected ray due to rotation of mirror
- Minimum size of mirror to see full image of a person.
- Real and virtual images

Sub unit 3.2: Reflection by spherical surfaces **[2 Hrs.]**

- Reflection by concave and convex mirrors
- Formation of image by concave and convex mirrors
- Derivation of mirror formula for concave and convex mirrors
- Uses of spherical mirrors
- Simple numerical Problems

Sub unit 3.3: Refraction through Plane Surfaces **[3 Hrs.]**

- Laws of refraction of light
- Speed of light in different media
- Principle of reversibility of light
- Lateral Shift
- Real and apparent depths
- Total internal reflection and critical angle
- Simple Numerical Problems

Sub unit 3.4: Refraction through Prism and Lenses **[5 Hrs.]**

- Deviation through prism and minimum deviation
- Refraction through lenses
- Formation of images by lenses
- Lens formula and lens maker's formula
- Combination of two thin lenses
- Power and magnification of lenses
- Uses of lenses in compound microscope and Astronomical telescope
- Simple Numerical Problems

Unit 4: Magnetism **[8 Hrs.]**

Sub unit 4.1: Magnets and magnetic fields **[3 Hrs.]**

- Magnetic poles, magnetic moments, magnetic axis, magnetic meridian, real and effective length of magnet
- Magnetic field, magnetic lines of force, Coulomb's law in magnetism
- Magnetic field intensity on axial and equatorial line due to magnetic poles of bar magnet
- Neutral points and Tangent's law
- Simple Numerical Problems

Sub unit 4.2: Terrestrial Magnetism **[2 Hrs.]**

- Horizontal and vertical components of earth's magnetic field
- Angle of declination and angle of dip
- Total intensity of earth's magnetic fields
- Simple Numerical Problems

Sub unit 4.3: Magnetic Properties of Materials **[3 Hrs.]**

- Molecular and modern theory of magnetism
- Dia, Para and Ferromagnetic materials

- Permeability, susceptibility and intensity of magnetization
- Domain theory of ferromagnetism
- Magnetic Hysteresis

Tutorial:
The instructors should practice the numerical problems of following topics as indicated by credit hours.

S. N.	Units	Sub Units	Credit Hrs.	
1	Mechanics	Units and Measurements	1	13
		Scalars and Vectors	1	
		Kinematics	2	
		Newton's Law of Motion	2	
		Works, Energy and Power		
		Gravity and Gravitation	1	
		Uniform Circular Motions	1	
		Simple Harmonic Motion	2	
		Rotation of Rigid Bodies		
		Heat phenomena and quantity of heat	2	
		Change of State and Hygrometry	1	
2	Heat and Thermo Dynamics	Thermal Expansion	2	10
		Transfer of Heat	2	
		Gas Laws and Kinetic theory of Gas		
		Thermodynamics	1	
		Reflection through Plane Surface	2	
		Reflection through Spherical Surface	2	
		Refraction through Plane Surface	1	
3	Optics	Refraction through prism and lenses	-	4
		Magnet and Magnetic Fields	1	
		Terrestrial Magnetism	1	
		Magnetic properties of Materials	2	
4	Magnetism	Permeability, susceptibility and intensity of magnetization	2	3
		Magnetic Hysteresis	1	
Total credit hour			**30**	

Engineering Physics Practical I **[30 Hrs.]**

1. Find volume and density of hollow tube using Vernier calipers.
2. Determine density of a steel / glass using micrometer screw gauge.
3. Determine thickness volume and density of a glass plate using spherometer.
4. Determine the acceleration due to gravity by using simple pendulum.
5. Determine the magnetic movement of a bar magnet using deflection magnetometer.
6. Determine the refractive index of the material of prism.
7. Determine the specific heat capacity of solid by the method of mixture.
8. Determine the specific latent heat of ice by the method of mixture.
9. Determine specific gravity of different solids by up thrust method.
10. Determine focal length of a converging lens by displacement method.

Prescribed Books

1. Engineering Physics –I, 5th edition, Devkota Binaya, Poudyal Khem Nath, Poudyal Dhan Prasad, Gupta Suresh Prasad, Laxmi publication Kathmandu.
2. Advanced level physics by Nelkon and Parker, 5th and later editions
3. College physics by sears, Zemansky and Young, Fourth and later editions
4. Physics practical by S.K. Neupane

Learning materials:

1. Reference to be selected by the related lecture(s) from among the texts available in the market that meet the content needs of this subject.
2. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject.

Evaluation Scheme

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the questions will be as indicated as in the table below.

S. N.	Units	Sub Units	Credit Hrs.		Total marks
1	Mechanics	Unit and Measurement	2	9	8
		Scalars and Vectors	3		
		Kinematics	2		
		Newton's Law of Motion	2		
		Works, Energy and Power	3	13	16
		Gravity and Gravitation	3		
		Uniform Circular Motions	3		
		Simple Harmonic Motion	2		
		Rotation of Rigid Bodies	2		
2	Heat and Thermal Dynamics	Heat phenomena and quantity of heat	3	18	16
		Change of State and Hygrometry	2		
		Thermal Expansion	3		
		Transfer of Heat	2		
		Gas Laws and Kinetic theory of Gas	3		
		Thermodynamics	5		
3	Optics	Reflection through Plane Surface	2	12	12
		Reflection through Spherical Surface	2		
		Refraction through Plane Surface	3		
		Refraction through prism and lenses	5		
4	Magnetism	Magnets and Magnetic Fields	3	8	8
		Terrestrial Magnetism	2		
		Magnetic properties of Materials	3		
Total credit hour			**60**	**60**	**60**

Engineering Chemistry-I
EG 1105 SH

Year: I **Total: 8 hours /week**
Semester: I **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description:
This subject consists of three units related to language of chemistry, general chemistry and system of classification.

Course Objectives:
After the completion of this subject, students will be able to

- Develop a basic knowledge and concept of chemical reactions.
- Solve simple numerical problems related on atomic weight, molecular weight, mole concept.
- Explain the different theories of acid and base and to know the concept of pH and buffer solution.
- Know about atomic structure, periodic table and chemical bonding.
- Prepare different concentration of solution and solve simple numerical problem.
- Describe the laws of electrolysis and solve related numerical problems.
- Explain the basic concept of Chemistry relevant to problems for the understanding and practicing related in engineering works.

Course Content

Unit 1: Language of Chemistry **[8 Hrs.]**

1.1. Symbol **[1 Hr.]**

- Introduction
- Definition
- Name and symbol of elements up to atomic number 30
- Concept of symbol which were derived from Latin or other languages such as Potassium, sodium, iron, copper, gold, lead, mercury, silver, and tin etc.
- Significances of symbol (qualitative and quantitative)

1.2. Formula, valency and radicals **[2 Hrs.]**

- Introduction
- Definition of molecular formula & Structural formula
- Qualitative and quantitative significances of molecular formula
- Concept of valency in terms of combining capacity with H2, O2 and Cl2
- Variable valency (ref Fe, Sn, Cu, Pb, Hg, S, N)
- Radicals
  - classify the radicals as electro- positive and electro – negative with examples
  - concept of simple, compound and complex radicals
- Methods of writing the molecular formula

1.3. Chemical equation **[5 Hrs.]**

- Introduction
- Essentials of chemical equation

- Significance of chemical equation (qualitative and quantitative)
- Limitation of chemical equation
- Making the chemical equation more informative
- Balancing chemical equation by
  - hit and trial method
  - partial equation method (ref. reaction involving HNO_3, MnO_2, $KMnO_4$, $K_2Cr_2O_7$ etc.)
- Types of chemical reaction:
  - combination, decomposition, displacement, double displacement, acid base, hydrolysis, polymerization
- Conditions of bringing about chemical reactions

Unit 2: General Chemistry **[16 Hrs.]**

2.1. Atom and molecule **[2 Hrs.]**

- Definition
- Postulates of Dalton's atomic theory
- Modern position of the theory
- Limitations of Dalton's atomic theory

2.2. Atomic weight **[4 Hrs.]**

- Introduction
- Definition
- Atomic weight of an element
- Atomic mass unit
- Gram atomic mass unit
- Concept of fractional atomic mass unit (ref giving example of chlorine)
- Dulong and Petit's method and its limitations
- Steps involved for the determination of atomic weight by Dulong and petit's method
- Solving related simple numerical problems

2.3. Molecular weight **[4 Hrs.]**

- Introduction
- Definition of molecular weight of an elements or compounds
- Gram molecular weight
- Concept of Avogadro's hypothesis
- Application of Avogadro's hypothesis:
  - determination of atomicity of an elementary gas like H_2, Cl_2, O_2, and N_2
  - determination of relationship between molecular Weight & Vapour density
  - determination of gram molecular volume of all gases is equal to22.4 litres at NTP
  - determination of gram molecular weight of any gas contains same no of molecules
- Avogadro's number
- Determination of molecular weight by Victor Meyer's method
- Solving related simple numerical problems

2.4. Equivalent weight **[4 Hrs.]**

- Introduction
- Definition of equivalent weight of element, acid, base and salt
- Gram equivalent weight
- Relation between equivalent weight, atomic weight and valency

- Determination of equivalent weight of metals by
  - by hydrogen displacement method
  - by direct and indirect oxide method
- Solving related simple numerical problems

2.5. Simple mole concept [2 Hrs.]

- Introduction
- mole of an atom, mole of a molecule, molar volume
- Solving related simple numerical problems

Unit 3: System of Classification [36 Hrs.]

3.1. Acids, Bases and Salts [5 Hrs.]

- Introduction
- Characteristics of acid and base
- Arrhenius concept of acid and base and its limitations
- Lowry and Bronsted concept of acid and base and its limitations
- Conjugate acid and base pair
- Amphoteric nature of water
- Lewis concept of acid and base and its limitations
- Salt
- Types of salts (normal, acidic and basic)
- pH and POH and its mathematical expression
- pH scale
- prove that pH+ pOH=14
- Simple numerical problem on pH
- Buffer solution with examples and its types (No buffer mechanism is required)

3.2. Volumetric analysis [5 Hrs.]

- Introduction
- Titration, acidimetry and alkalimetry
- Indicator and their colour and selection of indicators in acidic and basic medium
- End point
- Standard solution, unknown solution, normal solution
- Preparation of normal solution, decimolar solution, molar solution
- Normality factor
- Different ways of expressing the concentration of solution:
  - normality, molarity, gram per litre and percentage
- Concept primary standard substance and secondary standard substances
- Primary standard solution and secondary standard solution
- Volumetric equation
- Solving related simple numerical problems

3.3. Electronic theory of valency [4 Hrs.]

- Introduction
- Valence electron and valence shell, core electron, inert gas
- Concept of lewis dot symbol
- Octet rule
- Basic assumptions of electronic theory of valency
- Chemical bond
- Types of chemical bond

- Definition of electrovalent bond (ionic bond), electrovalency and electrovalent compounds (ionic compound) and electrovalent compounds like NaCl, MgO, CaS, MgCl2 etc. with electron dot structure showing the formation of electrovalent compounds
- General properties of ionic compounds
- Definition of covalent bond, covalency and covalent compounds and covalent compounds H2, Cl2, O2, N2, CH4, H2O, NH3, CO2, CH4, C2H2 etc. with electrons dot structure showing the formation of covalent compounds
- General properties of covalent compounds
- Definition of coordinate covalent bond (dative bond), coordinate covalency and coordinate covalent compounds and coordinate covalent compounds like SO2, SO3, NH4+, H2SO4, NaNO3, CaCO3, Na2CO3, Na2SO4 etc. with electron dot structure to represent the formation of coordinate covalent compounds
- General properties of coordinate covalent compounds

3.4. Electrolysis [6 Hrs.]

- Introduction
- Definition
- Electrolytes
- Types of electrolytes:
  - weak and strong and non-electrolytes
- Faraday laws of electrolysis
- Faraday
- Relation between Faraday, chemical equivalent and electrochemical equivalent
- Application of electrolysis
- Solving related simple numerical problems
  - Corrosion
    - Types of corrosion (chemical corrosion, bio-corrosion, electrochemical corrosion)
    - Rusting of iron (no explanation required the theory of rusting)
    - Prevention of corrosion
  - Electrochemical series
    - Introduction
    - Applications of electrochemical series

3.5. Periodic table [4 Hrs.]

- Introduction
- Mendeleev's periodic table(law)
  - Main features of Mendeleev’s periodic table (Explanation of short and long periods, groups, sub groups, zero group, VIII group)
  - Advantages of Mendeleev’s periodic table (Systematic study of elements, prediction of new elements and correction of doubtful atomic weight)
  - Anomalies of Mendeleev’s periodic table (position of hydrogen, position of isotopes, position of anomalous pair of elements, position of lanthanides and actinides, separation of similar elements and grouping of dissimilar elements)
- Modern periodic table(law)
  - Advantages of Modern periodic table (Position of hydrogen, position of isotopes, position of anomalous pair of elements)

3.6. Oxidation and reduction [6 Hrs.]

- Introduction

- Classical and electronic concept of oxidation and reduction
- Classical and electronic concept of oxidizing agent (oxidant) e.g. O2, O3, halogens, HNO_3, MnO_2, $K_2Cr_2O_7$, $KMnO_4$ etc. and reducing agent (reductants)eg.H_2, HBr, HI, H_2S etc.
- Redox reaction (concept of split into oxidation half and reduction half)
- Oxidation and reduction go side by side
- Oxidation number
- General rule for assigning oxidation number
- Methods of calculation the oxidation number of an atom in a compound
- Oxidation and reduction in terms of oxidation number
- Auto-oxidation eg.H_2O_2, HNO_2, SO_2
- Balancing of simple chemical equation by oxidation number method

3.7. Atomic structure [6 Hrs.]

- Introduction
- Concept subatomic particles like electron, proton and neutron concerning their charge, mass and location in atom (no explanation of cathode ray experiment is required)
- Rutherford's α - rays scattering experiment and its observations
- Rutherford's atomic model and its drawbacks
- Postulates of Bohr's atomic model
- Atomic number and mass number
- Isotopes, isobars and isotones
- Bohr - Bury Scheme
- Aufbau principle
- Electronic Configuration of atoms (atomic number 1-30)
- Hund's rule of maximum multiplicity
- Quantum number and its types (principal, azimuthal, magnetic and spin)
- Pauli's exclusion principle

Tutorial

Unit 1: Practice on writing the significances of symbol, molecular formula, chemical equation, balancing of chemical equation by hit and trial and partial methods. [**4 Hrs.]**

Unit 2: Practice on application of Avogardo's hypothesis, relation between atomic weight, equivalent and valency, Solve numerical problem on atomic weight, molecular weight, equivalent weight and mole concept. **[8 Hrs.]**

Unit 3: Practice on different theories of acid, base, types of salt, pH and pOH value, preparation of different types of solution, Faradays laws of electrolysis, different types of chemical bond and their electron dot structure, Mendeleev's periodic table and modern periodic table, different concept of oxidation and reduction, balancing of chemical equation by oxidation number method, Rutherford's and Bohr's atomic model, electronic configuration of atoms, solve numerical problem on pH, volumetric analysis, electrolysis **[18 Hrs.]**

Evaluation Scheme

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the questions will be as indicated as in the table below.

Unit	Chapter	Hours	Marks distribution
1	Symbol, formula, valency and radicals	3	4
	Chemical equation	5	4
2	Atom, molecule, Atomic weight	6	4
	Molecular weight	4	4
	Equivalent weight, mole concept	6	8
3	Acid, Base and salts	5	4
	Volumetric analysis	5	4
	Electronic theory of valency	4	4
	Electrolysis	6	4
	Periodic table	4	4
	Oxidation and reduction	6	8
	Atomic structure	6	8
	Total	**60**	**60**

Note: There may be minor deviation in marks distribution. Choice question can be asked from the same chapters.

Engineering Chemistry Practical I **[30hrs]**

1. Simple Glass Working [6hrs]
   a. cut the glass tube into three equal parts and round up their shape edges
   b. bore a hole through a cork
   c. bend the glass tubing into acute, obtuse and right angle
   d. draw a jet and capillary tube
   e. fit up a wash bottle
2. Neutralize dilute sulphuric acid with sodium hydroxide solution, and to recover crystals of sodium sulphate.
3. Obtain pure and dry precipitate of barium sulphate by treating dilute sulphuric acid with barium chloride solution. [2hrs]
4. Separate sand and copper sulphate crystals in pure and dry state from the mixture of sand and copper sulphate. [2hrs]
5. Separate sand and calcium carbonate in pure and dry state from the mixture of sand and calcium carbonate. [2hrs]
6. Prepare pure water from supplied impure water by distillation and to test the purity of the sample prepared. [2hrs]
7. Determine the equivalent weight of reactive metal by hydrogen displacement method. [2hrs]
8. Prepare primary standard solution of sodium carbonate and to use it to standardize an approximate decinormal acid solution. [2hrs]
9. Standardize given unknown acid (Approx N/10) solution by preparing standard alkali solution. (Expression of strength in different ways) [2hrs]
10. Standardize given unknown alkali (approximately N/10) solution with the help of by preparing standard acid solution. (Expression of strength in different ways) [2hrs]

11. Determine the pH of different unknown solution and using pH paper and universal indicator. [2hrs]
12. Investigate the composition of water by electrolysis by using Hofmann's apparatus. [2hrs]
13. Carry out conductivity experiments on solids and liquids ($CuSO_4$, Zn, Mg, Al, Fe, CCl_4, C_6H_6, C_2H_5OH) [2hrs]

Prescribed Books:

1. Foundations of Chemistry, Vol. 1, M.K. Sthapit and R.R. Pradhananga, Taleju Prakashan, Kathmandu
2. A Textbook of Engineering Chemistry, vol. I, Prakash Paudel, Siddthartha Publication, Kathmandu
3. Engineering Chemistry, Vol.1 M.L. Sharma, K. M. Shrestha, PN, Choudhary, Ekta Book, Kathmandu.
4. A Text book of Chemistry, Jha and Guglani, Surya publication, India
5. Fundamentals of Chemistry, K.R. Palak, Ratnapustak Bhandar, Kathmandu
6. Elementary Practical Chemistry, M.K. Sthpit, Taleju Prakashan, Kathmandu
7. Practical Engineering Chemistry for diploma level, Sumitri Bajracharya, Sabina Shrestha, Kathmandu Institute of Technology

Other Learning Materials:

1. Other references to be selected by the related lecturer(s) from among the texts available in the market that meet the content needs of this subject.
2. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject.

Engineering Drawing I
EG 1101 AR

Year: I **Total: 5 hours /week**
Semester: I **Lecture: 1 hour/week**
Tutorial: hours/week
Practical: 4 hours/week
Lab: hours/week

Course description:
This course is designed to provide knowledge and skills on geometrical shapes, and its construction procedure, and interpretation of the views of objects by orthographic projection.

General objectives:
After the completion of this course students will be able to:
1. Handle drawing instruments and materials;
2. Identify Geometrical construction and shape;
3. Describe the scale, its type and construction;
4. Draw different types of engineering curves and
5. Draw and interpret the multi view of solids with scale and dimensioning.

Course Contents:

Theory

Unit 1: Introduction of Engineering Drawing: [2 Hrs.]
1.1 Types of drawing i.e. Engineering drawing and Artistic drawing and Engineering drawing define as Graphical language or universal language of engineering technical persons.
1.2 Introduction of drawing material i.e. drawing as drawing paper, drawing board, adhesive tape, pencil, eraser, sharpener etc.
1.3 Drawing tools like set square, compass divider etc.
1.4 Conventional line and its type and their uses and line weight
1.5 Drawing paper size and simple graphical symbols of civil works (at least 10 symbols).
1.6 Practical exercise of horizontal, vertical, inclined line using the Drawing tools and material with symbols and paper sizes. (Sheet No. 1)

Unit 2: Lettering, scales and dimensions: [4 Hrs.]
2.1. Lettering [1 Hr.]
2.1.1 Introduction of single stroke letter and their ratio between height and breadth.
2.1.2 Introduction of upper- and lower-case letter.
2.1.3 Introduction of Vertical and inclined (*italic*) letter (with inclined angle).
2.1.4 Practical exercise of letter writing using the guide lines of vertical and italic letter, (Sheet No 2).
2.2. Scale [1.5 Hrs.]
2.2.1 Introductions of scale and importance
2.2.2 Types of scale (full, reducing and enlarge)
2.2.3 Construction of scale using the representative factor.
2.3. Dimensioning [1.5 Hrs.]
2.3.1 Introduction of dimensioning.
2.3.2 Terminology of dimensioning i.e. Dimension line, extension line leaders line etc.
2.3.3 Termination of dimension line using arrowhead, slash and dot.

2.3.4 Dimensioning System-Aligned system, unidirectional system and base line dimensioning.
2.3.5 Principles of dimensioning.
2.3.6 Dimensioning pictorial views and orthographic view

Unit 3: Geometrical constructions: [2 Hrs.]

3.1. Geometric primitives (line, triangle, quadrilateral, regular polygons and circle and its name of its parts).

3.2. Division

3.2.1 Division of line – Bi-section of line, tri-section of line, division of line in any number of parts and division of the line in proportionally
3.2.2 Division of circle- Division of circle in three, four, five, six, seven and eight parts.
3.2.3 Division of angle- bi-section and trisection.
3.2.4 Division of triangle and trapezium in any number of equal parts of area.

3.3 Construction of triangle, square and regular polygons.
3.4 Inscribing and describing of circle in/on triangle or polygons.
3.5 Tangency- open and crossed line tangent, Arc tangent –internal, external and combined Arc tangent.

Unit 4: Engineering Curve: [1 Hr.]

Introduction of following curves:

4.1 Involutes
4.2 Spiral
4.3 Cycloid
4.4 Helices

Unit 5: Conic- Section: [1 Hr.]

5.1 Cone and its parts name
5.2 Introduction of sectional plane
5.3 Definition of conic section
5.4 Terminology of conic section after the cut by sectional plane (As ellipse, Parabola and Hyperbola)

Unit 6: Orthographic Projection:

6.1 Introduction of orthographic projection [2 Hrs.]

6.1.1. Theory of projection
6.1.2. Four quadrant, plane of projection
6.1.3. Introduction of co-ordinate or three-dimensional axis
6.1.4. System of orthographic projection
6.1.5. Making of orthographic view
6.1.6. Analysis of object and its view

6.2 Point and line projection [0.5 Hr.]

6.2.1. Notation system on HP, VP and PP
6.2.2. Location of point /line i, e. where it is and projection on plane of projection
6.2.3. Position of line: - Perpendicular to one plane and parallel to the other, parallel to both plane and inclined to one or both planes

6.3 Plane projection [0.5 Hr.]

6.3.1. Perpendicular to one plane and parallel to the other, perpendicular to both planes, perpendicular to one plane and inclined to the other

6.4 Projection of solids **[2 Hrs.]**

6.4.1. Orthographic projection of geometrical solid i.e. prism, cylinder and cone in simple Position. (simple position means axis- perpendicular to one plane (HP) and parallel to (VP) axis parallel to both planes

6.4.2. Orthographic projection of different model or work pieces. (at least 10 to 15 model pieces)

Practical (Class work sheet)

Sheet No 1: **[6 Hrs.]**

1. Draw horizontal, vertical, inclined (45°, 135°, 30°,60°,120°,150°,75°,105° degree) line and circle using the drawing tools**,**
2. Draw line type-visible (boarder), construction, dashed, (thick and thin), centre line, dimension, extension, leader line, section line, wavy line, continuous or short/break up line.

Sheet No 2: **[6 Hrs.]**

1. Practice free hand lettering exercise on upper and lower-case vertical letter using horizontal and vertical guide line (at least one set).
2. Practice free hand lettering exercise on upper and lower-case inclined letter with numerical using the horizontal and vertical guide line (at least one set).
3. Practice free hand lettering exercise on upper case letter using horizontal guide line of different height letter of 10 to 3mm height.
4. Draw symbols of general civil /electrical/ plumbing work.
5. Perform paper size scheduling work (A0 to A4 size).

Sheet No 3: **[3 Hrs.]**

1. Perform dimensional practicing exercise on aligned, unidirectional and base line dimension
2. Perform scale construction

Sheet No 4: **[9 Hrs.]**

1. Perform Line- bisection, trisection, line division any number of parts, with proportional division, circle division in three, four five, six, seven and eight parts, area of triangle and trapezoid division any number of equal parts.
2. Construct triangle by given sides, making equilateral triangle/square and regular Polygons (pentagon, hexagon, heptagon etc.)
3. Find the centre of Arc, making the circle touching the three points. Describing the circle on triangle, inscribe the circle in right angle triangle, Equilateral triangle, and scalene triangle and inscribing the circle in a sector.
4. Draw tangent from any point on circle, open and crossed line (belt) tangent. Arc Tangent-Internal, External and combined.

Sheet No 5: **[6 Hrs.]**

Draw:

1. Involutes- Line, triangle and circular involutes with tangent.
2. Spiral construction (mentioning the pole, vector radius, vector angle and Convolution)
3. Cycloid – Cyclonical curve with tangent
4. Helices- Cylindrical helix with pitch angle, conical helix.

Sheet No 6: **[6 Hrs.]**

Draw:

1. Ellipse-Concentric circle, oblong (Rectangle), Foci and Eccentricity method.
2. Parabola-Rectangle, offset, Tangent and Eccentricity method.
3. Hyperbola- Rectangle and Transverse axis method.

Sheet No 7: **[6hrs]**

Perform/draw:

1. Point projection- Point projection by given location by first and third angle projection (At least two exercise)
2. Line projection-perpendicular to one plane and parallel to other plane, parallel to both planes, parallel to both planes inclined to one or both planes.

Sheet No 8: **[3 Hrs.]**

Perform/draw**:**

1. Plane of projection-Perpendicular to one plane and parallel to other, perpendicular to both the planes, perpendicular to one plane and inclined to other (At least three exercise)

Sheet No 9: **[3 Hrs.]**

Perform/draw:

1. Solid projection-Orthographic projection of simple geometrical solid in first and third angle projection.

Sheet No 10: **[12 Hrs.]**

1. Analyze the view and draw orthographic projection of flat, inclined and circular surfaced model (At least 15 exercises) of the given objects.

References:

1. Luzzadar W. I Fundamental of Engineering drawing. Prentice-Hall of India
2. S. Bogolyubov and A. Voinov, Engineering drawing. Mir Publishers, Moscow.
3. S. K Bogolyubov, Exercises in Machine Drawing. Mir publishers, Moscow.
4. K. Venugopal Engineering Drawing and Graphics, New age international (p) Ltd. India
5. Gill. P. S. Engineering Drawing, S. K. Kataria and sons India.
6. M. B. Shah and B.C. Rana, Engineering Drawing, Pearson India,
7. N. D. Bhatta and Panchal V.M. Engineering Drawing Charotar publishing House India.

Computer Application
EG 1101 CT

Year: I **Total: 4 hours /week**
Semester: I **Lecture: 2 hour/week**
Tutorial: hours/week
Practical: 2 hours/week
Lab: hours/week

Course Description:
This course deals with the history of computer development, hardware components, Operating systems, Software applications, Computer networks and Internet. Students will learn classifications of computers, its architecture and software application installations, Peripheral devices installation, computer networks, internet and their use in various purposes.

Course Objectives:
On completion of this course the students will be able to:
1. Understand the basic architecture of Computer;
2. Identify major components of computer and their role;
3. Know the different Operating Systems like MS-DOS, Windows etc.;
4. Use the different Software applications and
5. Understand the basic networking and internet concept.

Course Contents:

Theory

Unit 1 Introduction to Computers: [2 Hrs.]
- 1.1 History of computers
- 1.2 Generation and type of computers
- 1.3 Computer hardware and software

Unit 2 Hardware Components: [6 Hrs.]
- 2.1 Major blocks of a digital computer
- 2.2 Input devices like keyboard, mouse, joystick, scanner, light pen etc.
- 2.3 Output devices like monitor, printer, plotter, sound card, speaker etc.
- 2.4 Central Processing Unit
- 2.5 Memory Unit: RAM, ROM, PROM, EPROM
- 2.6 Auxiliary storage devices:
  - Magnetic storage like floppy disk, hard disk, magnetic tape etc.
  - Optical storage like CD-ROM, DVD
  - Pen drive, flash memory card etc.

Unit 3 Introduction to Operating System Software: [6 Hrs.]
- 3.1 Importance and use of operating systems (OS)
- 3.2 Type of OS: MS-DOS, Windows, Unix, Linux
- 3.3 File management, device management and memory management by OS
- 3.4 MS-DOS system files: io.sys, msdos.sys, command.com, config.sys, autoexec.bat
- 3.5 MS-DOS internal and external commands
- 3.6 Windows Operating System: Graphical User Interface and windows environment, file/folder management
- 3.7 Linux: GNU open source operating system

Unit 4 Application Packages: [7 Hrs.]

4.1 Text Editors (edit in DOS, notepad in Windows, vi editor in Linux
4.2 Word Processing Package: Microsoft Word
4.3 Spreadsheet Package: Microsoft Excel
- Entering data
- Using formula
- Basic calculations
- Financial calculations
- Charts

4.4 Concept of Database management system
4.5 Database management package: Microsoft Access
4.6 Presentation Package: Microsoft PowerPoint

Unit 5 Utility Programs: [2 Hrs.]

5.1 Computer virus and its removal (antivirus programs)
5.2 Multimedia: Audio, Video and Graphics

Unit 6 Networks and Internet: [7 Hrs.]

6.1 Brief Introduction of LAN, MAN, WAN
6.2 Topologies: Bus, Ring and Star
6.3 Hub, Switch, Modem
6.4 Network Cabling
6.5 NIC
6.6 Network OS
6.7 Client and server concept
6.8 File and print sharing
6.9 Email/Internet
- World Wide Web (WWW)
- ISP
- Search Engines
- Internet Client: Web browsers like Internet Explorer, Netscape Navigator, Mozilla Firefox etc.,
- Email clients like Outlook Express, Netscape Mail etc.

Practical [30 Hrs.]

1. Identification of major components of computer and familiarization with keyboard and mouse. (1 session)
2. Internal and External DOS commands (1 session)
3. Windows Graphical User Interface and file/folder management (1 session)
4. Microsoft Word (2 sessions)
   a. Editing text
   b. Formatting document
   c. Creating tables
   d. Creating graphics and word art
5. Microsoft Excel (3 sessions)
   a. Editing worksheet
   b. Data formatting and manipulation
   c. Analysis of data (use of functions for calculation)
   d. Charts/Data presentation
   e. Import/Export data

6. Microsoft Access (2 sessions)
    a. Creating and manipulating data tables
    b. Query
    c. Forms/Reports
7. Using Multimedia and Internet/Email (1 session)
8. Creating effective presentation using Microsoft PowerPoint (1 session)
9. Project Work (3 sessions)

The students will be assigned (individually or in group) a project work based on Microsoft Excel or Access. The students are required to prepare a short report in MS Word and prepare a short presentation in PowerPoint.

Textbooks:

1. Rajaraman, "*Fundamentals of Computers*", Prentice-Hall of India

References:

1. B Ram, "*Computer Fundamentals*", Willey Eastern Publishers
2. S Saxena, "*A First Course in Computers"*, Vikash Publishing
3. Winn Rosch, "Harware Bible"
4. Noel Kalicharan, "Introduction to computer Studies", Cambridge Low Price Edition
5. P.K Sinha, "Computer Fundamentals"

Second Semester

Subjects:

1	EG 1201 SH	Engineering Mathematics II
2	EG 1202 SH	Engineering Physics II
3	EG 1203 SH	Engineering Chemistry II
4	EG 1201 CE	Workshop Practice I
5	EG 1201 AR	Engineering Drawing II
6	EG 1202 CE	Applied Mechanics

Engineering Mathematics II
EG 1201 SH

Year: I **Total: 6 hours /week**
Semester: I **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: hours/week

Course Description:
This course consists of five units namely: Algebra, Conic sections, Geometry, Vectors, Statistics and Probability; which are basically necessary to develop mathematical knowledge and helpful for understanding as well as practicing their skills in the related engineering fields.

Course Objectives:
On completion of this course, students will be able to understand the concept of the following topics and apply them in the related fields of different engineering areas

- Ideas of algebraic relations between variables, complex number system, Matrices and determinants, linear equations and inequalities, linear programming
- Two- and three-dimensional geometry, Vectors and their products
- Statistics and Probability

Unit 1: Algebra **[18 Hrs.]**

1.1 Polynomial equations
Quadratic equations, nature and relation between two roots, formation of quadratic equation, condition of common roots

1.2 Complex numbers
Definition, algebra, geometric representation, modulus, conjugate of complex numbers, square root, polar form, product and quotient of complex numbers, De Moivre's theorem and its applications to find the roots of complex numbers, properties of cube root of unity

1.3 Matrices and Determinants
Definitions, orders, types, algebraic operations, transpose of matrices and their properties without proofs. Definition, expansion and properties of determinants (without proofs), inverse of matrix

1.4 Solution of system of linear equations
Cramer's rule, inverse matrix method, row equivalent method

1.5 Linear inequalities and graphs up to two variables

1.6 Linear programming by graphical method

Unit 2: Conic Sections **[6 Hrs.]**

2.1 Parabola

- Standard equation of parabola
- Equation of parabola vertex at any point (without proof)
- General equation (simple problems to find vertex, focus and equation of directrix)

2.2 Ellipse and Hyperbola

- Standard equation of ellipse and hyperbola (without proof)
- Equation of ellipse and hyperbola center at any point (without proof)
- Center, vertex, foci, directories of ellipse and hyperbola

Unit 3: Geometry **8hrs**

3.1 Coordinate in Space

- Rectangular Cartesian co-ordinates
- Distance and section formulas (without proofs)
- Direction cosine and ratio of a line, Projections
- Angle between two lines

3.2 Planes

- General equation of plane (without proofs)
- Equation of plane in intercept and normal forms (without proofs)
- Equation of plane through a point
- Angle of between two planes
- Length of perpendicular from a point on a plane

Unit 4: Vectors **10hrs**

4.1 Definitions and Algebra of Vectors

- Definitions, notations and representations of vectors
- Modulus and direction cosines of a vector
- Algebra of vectors, Types of vectors
- Linear dependent and independent vectors, Coplanar vectors

4. 2 Product of Two Vectors

- Scalar product of two vectors, geometrical meaning, properties and angle between two vectors without proofs, simple applications in plane trigonometry
- Vector product of two vectors, geometrical meaning, properties and angle between two vectors without proofs, determinant form of vector product, simple applications in plane trigonometry, vector equation of a straight line

Unit 5: Statistics and Probability **[18 Hrs.]**

5.1 Statistics

- Revision: measures of central tendency (Mean, median, mode. quartiles, deciles and percentiles)
- Measure of dispersion (Range, mean deviation, quartile deviation and standard deviation)
- Skewness, Correlation (Karl Pearson's method), Regression analysis

5.2 Probability

- Basic terms of probability theory
- Concept of mutually exclusive events
- Definitions and basic laws of probability (without proofs)
- Probability in terms permutation and combination

5.3 Theoretical Probability Distributions

- Random and discrete random variables
- Binomial and normal distributions

Tutorial

1. **Algebra** **[12 Hrs.]**
    - Polynomial equations [2 Hrs.]
    - Complex numbers [3 Hrs.]
    - Matrices and Determinants [4 Hrs.]
    - Solution of system of linear equations [2 Hrs.]
    - Linear inequalities and graphs up to two variables and linear programming by graphical method [1Hr]

2. **Conic Sections** **[3 Hrs.]**
   - Parabola [2 Hrs.]
   - Ellipse and Hyperbola [1 Hrs.]
3. **Geometry** **[4 Hrs.]**
   - Coordinate in Space [2 Hrs.]
   - Planes [2 Hrs.]
4. **Vectors** **[5 Hrs.]**
   - Definitions and Algebra of Vectors [2 Hrs.]
   - Product of Two Vectors [3 Hrs.]
5. **Statistics and Probability** **[6 Hrs.]**
   - Statistics [3 Hrs.]
   - Probability [2 Hrs.]
   - Theoretical Probability Distributions [1 Hrs.]

Evaluation Scheme

Unit wise Marks division for Final

S. No.	Units	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Algebra	4 x 2 = 8	4 x 4 = 16	24
2	Conic Sections	2 x 2 = 4	2 x 4 = 8	12
3	Geometry	2 x 2 = 4	2 x 4 = 8	12
4	Vectors	3 x 2 = 6	2 x 4 = 8	14
5	Statistics and Probability	3 x 2 = 6	3 x 4 = 12	18
		14 x 2 = 28	**13 x 4 = 52**	**80**

Reference Books

1. Thapa G. B. et al., Engineering Mathematics (Volume II, Three Years Diploma), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
2. Bajracharya D. R. et al., Basic Mathematics (Grade XI/XII), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
3. Bajracharya B. C., Mathematics and Statistics for Economics, M K publishers and distributors, Bhotahity, Kathmandu, Nepal
4. A Text book of Statistics – B.C. Bajracharya
5. Elementary Statistics – H. C. Saxena
6. Nath et al., Engineering Mathematics II, Vidhyarthi Publisher and distributors, Bhotahity, Kathmandu, Nepal
7. Other references selected by the related lecturer(s) from among the texts available in the market that meet the content of this subject.

Engineering Physics II
EG 1202 SH

Year: I **Total: 8 hours /week**
Semester: II **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description
This course in physics is designed to provide students with an understanding of the scientific laws of our physical world, and how physics contributes to life's activities in modern society. The course emphasizes both quantitative and qualitative aspects of physics, involving mathematical models and equations. The application of physics to social and environmental situations is well illustrated.

The practical component of this course is designed to supplement learning through the application of learned theory. The students will handle simple apparatus to do simple measurements, demonstrate simple electrical circuits, and apply their knowledge of physics to real life examples.

Course objectives
On completion of the course the student will be able to:
- Sustain interest in physics and its applications related to everyday experiences of their life
- Identify the social, economic, environmental and other implications of physics
- Describe physics as a coherent and developing framework of knowledge based on fundamental theories ofthe structures and processes of the physical world
- Demonstrate the skills of experimenting, observing, interpreting data and evaluating evidence to formulate generalizations and models
- Apply knowledge of physical principles to familiar and unfamiliar situations
- Apply facts, vocabulary and conventions to unit measurements and common measuring instruments
- Explain the definitions, laws, concepts, theories and models presented in this course.
- Describe the applications and implications of physical facts and principles.
- Explain the basic concept of Physics relevant to problems for the understanding and practicing related in engineering works.

Course Contents

Theory

Unit 1: Electrostatics, Current and Electromagnetism [20hrs]

Sub-Unit 1.1: Electrostatics and capacitors 4hrs]
- Elementary charges, charging by induction
- Faraday`s Ice-pail experiment, electric field, lines of force
- Coulomb`s law, intensity of electric field
- Electrostatic potential, equipotential surfaces, action of points
- Capacitors, types of capacitors
- Grouping of capacitors, action of dielectrics

- Simple Numerical Problems

Sub-unit 1.2: Current Electricity **[7 Hrs.]**

- D.C. current, strength of current
- Potential difference across a conductor
- Ohm' law and its verification
- Resistance and resistivity
- Connection of resistances
- Galvanometer and its conversion into ammeter and voltmeter
- Potentiometer and its use to measure emf
- Wheat stone bridge
- Kirchhoff's laws and their uses in simple circuits
- Joule's law of heating
- The rate of heating from the concept of p.d.
- See- beck effect, Peltier effect, Thomson effect
- Simple Numerical Problems

Sub- unit 1.3: Magnetic effect of current and electromagnetism **[6 Hrs.]**

- Magnetic forced and magnetic field of current
- Force experienced by a charge moving in magnetic field
- Force acting of current carrying conductor
- Statement of Biot - Savart's law
- Magnetic field due a long straight conductor and due to a circular coil
- Force acting between two current carrying parallel conductors
- Application of Ampere's law to calculate magnetic field due to a solenoid
- Faraday's laws of electromagnetic induction
- Lenz's law
- Self- induction and mutual induction in coils
- Working of transformer
- Simple Numerical Problems

Sub- unit 1.4: Alternating current **[3 Hrs.]**

- Generation of A.C. by A.C. generator
- Instantaneous and effective values of current and voltage
- Relation between voltage and current in R and L circuit
- Phase between current and voltage
- Resonance and power in A.C. circuit
- Simple Numerical Problems

Unit 2: Waves and optics **[13 Hrs.]**

Sub- unit 2.1: Wave motion **[3 Hrs.]**

- Wave motion and its type
- Characteristics of wave motion
- Wavelength, frequency and speed of waves
- Velocity of waves in different media
- Simple Numerical Problems

Sub- unit 2.2: Sound waves **[5 Hrs.]**

- Reflection, refraction, diffraction, interference
- Beats and beat frequency
- Determination of beat frequency
- Progressive waves, stationary waves and their equations

- Waves in pipes and strings
- Fundamental mode and overtones in pipes and strings
- Intensity of sound, intensity level and inverse square law
- Simple Numerical Problems

Sub- unit 2.3: Physical **[5 Hrs.]**

- Coherent sources of light and interference
- Phase difference and path difference
- Young's double slit experiment
- Diffraction and polarization of light
- Brewster's law
- Huygen's principle
- Simple Numerical Problems

Unit 3: Properties of matter **[10 Hrs.]**

Sub unit 3.1: Elasticity **[4 Hrs.]**

- Elasticity; Hooke's law
- Stress, strain, Young's modulus, Bulk modulus and shear modulus.
- Energy stored in stretched string
- Simple Numerical Problems

Sub-unit 3.2: Surface Tension **[3 Hrs.]**

- Intermolecular attraction in liquid, surface tension
- Cohesion and adhesion, angle of contact
- Surface energy, capillary action
- Simple Numerical Problems

Sub-unit 3.3: Viscosity **[3 Hrs.]**

- streamline and turbulent flows
- Idea of liquid layers, velocity gradient, coefficient of viscosity
- Viscous forces, Stoke's law, terminal velocity
- Simple Numerical Problems

Unit 4: Modern Physics **[17 Hrs.]**

Sub-unit 4.1: Atomic Physics **[9 Hrs.]**

- Motion of charged particles in electric and magnetic fields
- e/m for electrons, Millikan's oil drop experiment
- Photons, photoelectric effect, Stopping potential for photoelectrons
- Einstein's photoelectric equation
- Bohr's model for hydrogen atom
- Energy level diagram and spectral series
- X-rays; production, properties and applications
- Introduction of Laser
- Simple Numerical Problems

Sub-unit 4.2: Semiconductors **[5 Hrs.]**

- Valence electrons and Energy bands in solids
- Intrinsic and doped p-type, n-type semiconductors
- Charge carriers in semiconductors
- Acceptors, donors, p-n junction diode
- Depletion layer, forward and reverse biasing
- Rectifying properties of a diode

- Simple Numerical Problems

Sub-unit 4.3: Nuclear Physics **[3 Hrs.]**

- Laws of radioactive disintegration
- Half-life, mean-life and decay constant
- Stable and radioactive nuclei
- Binding energy, nuclear fission, critical mass and nuclear fusion
- Simple Numerical Problems

Tutorial:

The instructors should practice the numerical problems of following topics as indicated by credit hours

S. N.	Units	Sub Units	Credit hours	
1	Electricity	Electrostatics and Capacitors	4	14
		Current Electricity	5	
		Magnetic effect of current and Electromagnetism	3	
		Alternating Current	2	
2	Waves	Wave motions	2	8
		Sound waves	1	
		Physical Optics	2	
		Elasticity	3	
3	Properties of Matter	Viscosity	1	5
		Surface Tension	1	
		Semi-conductors	3	
4	Modern Physics	Nuclear Physics	3	3
Total Hours			**30**	**30**

Engineering Physics Practical II **[30 Hrs.]**

1. Determine specific resistance of a wire.
2. Determine the frequency of A.C. mains.
3. Study current voltage characteristics of a junction diode.
4. Determine speed of sound by resonance air column method.
5. Determine Young Modulus.
6. Verify Ohm's law.
7. Determine force constant of a helical spring oscillation method.
8. Compare Emfs of two cells by using potentiometer.
9. Study characteristics curves of npn transistor.
10. Determine unknown resistance by Wheatstone bridge method.

Learning materials:

1. Advanced level physics by Nelkon and Parker, 5th and later editions
2. College physics by sears, Zemansky and Young, Fourth and later editions

Textbooks for laboratory work:

1. Physics Practical book by S.K. Neupane.

Other learning materials:

1. Reference to be selected by the related lecture(s) from among the texts available in the market that meet the content needs of this subject.
2. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject.

Evaluation Scheme

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the questions will be as indicated as in the table below.

S. N.	Units	Sub Units	Credit hours		Total marks
1	Electricity	Electrostatics and Capacitors	7	20	12
		Current Electricity	4		
		Magnetic effect of current and Electromagnetism	6		12
		Alternating Current	3		
2	Waves	Wave motions	3	13	12
		Sound waves	5		
		Physical Optics	5		
3	Properties of Matter	Elasticity	4	10	8
		Viscosity	3		
		Surface Tension	3		
4	Modern Physics	Atomic Physics	9	17	16
		Semi-conductors	5		
		Nuclear Physics	3		
	Total credit hours		**60**	**60**	**60**

Engineering Chemistry II
EG1203SH

Year: I **Total: 8 hours /week**
Semester: II **Lecture: 4 hour/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description*:*
This subject consists of three units related to nonmetals and their compounds, metals and their compounds and organic compounds and polymers.

Course Objectives:
After the completion of this subject, students will be able to

- Know about causes of hardness of water and its remedy.
- Develop the knowledge of physical and chemical properties of different materials.
- Explain about the manufacturing process of ammonia, Nitric acid and sulphuric acid.
- Know about alkali metals, alkaline earth metals and coinage metals and their properties.
- Prepare laboratory method and their properties of different compounds.
- Write IUPAC naming of organic compounds.
- Provide the student's background of basic concepts of chemistry required for understanding and practicing related in engineering works.

Course Content:
Unit 1: Non-metals and their compounds: [30 Hrs.]
1.1 Water: [4 hours]

- Introduction
- Sources of water
- Types of water
- Causes and types of hardness of water
- Methods of removal of temporary hardness by:
  - Boiling and Clark's methods
- Methods of removal of permanent hardness by:
  - Washing soda and permutit process and its advantages
- General concept on Water treatment for domestic and industrial purpose
  - Water for drinking purposes, water for boiler purposes, water for washing purposes
- Conditions of potable water
- Concept of amphoteric and universal solvent of water

1.2 Ammonia: [4 Hrs.]

- Introduction
- Laboratory preparation of ammonia gas
- Manufacture of ammonia by Haber's process (ref. principle, condition for higher yield and process)
- Physical Properties
- Chemical properties:
  - Basic nature, dissociation, auto-ionization
  - Reduction reaction

        - Combustion, catalytic oxidation of ammonia, oxidation of heated copper oxide
    - Action with halogens(chlorine)
    - Action with metals (Na Or K)
    - Action with metallic salts solution like Iron, aluminum, zinc and chromium
    - Formation of complex amines with the salts solutions of d block transitional elements like copper, silver, Nickel and Cobalt
    - Action with Carbon dioxide
    - Action with bleaching powder
- Uses

1.3 Nitric acid: [8 Hrs.]

- Introduction
- Manufacture of nitric acid by Ostwald's process (ref. principle, process and advantages)
- Physical Properties
- Chemical properties:
    - Action of heat
    - Acidic character
    - Oxidizing character
        - action on non-metals like carbon, Sulphur, phosphorus and iodine
        - action on metalloids like arsenic and antimony
        - action on inorganic compounds like Sulphur dioxide, hydrogen sulphide and acidified ferrous sulphates
        - action on metals like Zinc, Magnesium, Iron, copper, mercury and silver
        - action on noble metals like gold and platinum (with aqua regia)
- uses
- Nitrogen cycle (explain with flow chart diagram)
- Nitrogen fixation and it occurs (natural and artificial)
- Fertilizers
    - Types of fertilizers
    - Functions of essentials nutrients
    - Characteristics of fertilizers
    - Classification of chemical fertilizers (ref N,P,K and mix)
- Pollution and pollutant(introduction)
- Oxides of nitrogen and Sulphur as pollutant and acid rain

1.4 Halogens (Chlorine): [3hrs]

- Introduction
- Laboratory preparation of chlorine
    - by applying heat
    - without application of heat
- Physical Properties
- Chemical properties:
    - action with hydrogen
    - action with water
    - action with sodium hydroxide, potassium hydroxide and calcium hydroxide
    - action with ammonia
    - oxidizing character:
        - action of chlorine in presence of water (ref Hydrogen sulphide, Sulphur dioxide, acidified ferrous sulphate)
        - action of chlorine in absence of water (ref, ferrous chloride, stannous chloride)

- Bleaching character
- Action with bromides and iodides
- Action with metals like copper, zinc, aluminum and iron
- Action with metalloids like arsenic and antimony
- Action with non-metals like Sulphur and phosphorus
- Action with organic compounds like methane and ethene

- uses

1.5 Hydrochloric acid: [2 Hrs.]

- Introduction
- Laboratory preparation of HCl gas and aqueous HCl
- Physical Properties
- Chemical properties:
  - acidic character
  - action with ammonia
  - reducing character (action with oxidizing agents)
    - action with manganese dioxide, potassium permanganate and potassium dichromate
  - action with AgNO3
  - formation of aqua regia
  - action with lead acetate
  - action nonmetals
  - action with air
- uses

1.6 Hydrogen sulphide: [2 Hrs.]

- Introduction
- Laboratory preparation of hydrogen sulphide (pure and dry state)
- Physical Properties
- Chemical properties:
  - Acidic character
  - Dissociation
  - Reducing properties
    - action with ferric chloride, halogens, acidified potassium permanganate, acidified potassium dichromate, Sulphur dioxide, sulphuric acid and nitric acid
  - Action with metals
  - Action with lead acetate
  - Precipitation of metals sulphide (acidic and basic medium)
- uses

1.7 Sulphuric acid: [4 Hrs.]

- Introduction
- Manufacture by contact process (ref principle, condition and process)
- Physical Properties
- Chemical properties:
  - action of heat
  - acidic nature
  - precipitation reaction
  - oxidizing agent (ref. nonmetals like Sulphur, carbon, phosphorus, hydrogen halide, hydrogen sulphide, metals
  - dehydrating action, (ref. sugar, starch, formic acid, oxalic acid, alcohol, copper sulphates crystals)

- action with SO_3
- uses

1.8 Carbon and its compounds: [3 Hrs.]

- Introduction
- Allotropy
- Allotropic form of carbon (just give flow sheet)
- Structure, properties and uses of diamond and graphite
- Oxides of carbon (Ref. sources of carbon dioxide & carbon mono oxide and its effect)
- Concept of greenhouse effect and global warming

Unit 2: Metals and their compounds [15 Hrs.]

2.1 General study of Metals and their components: [5 Hrs.]

- Introduction
- Distinguish between metals and non-metals (ref. physical and chemical properties: at least any fifteen differences)
- Occurrence of metals
- Definition and types of alloys (ref. ferrous and non-ferrous alloys)
- Purpose of making alloys
- Metalloids
- Amalgam
- Chemistry of metallic carbonate
  - General methods of preparation of metallic carbonate
    - by passing carbon dioxide into oxides or hydroxides
    - by heating bicarbonates
    - by double decomposition (preparation of insoluble carbonates)
  - General properties of metallic carbonates
    - action with water
    - action of heat
    - action with acids
- Chemistry of metallic sulphate
  - General methods of preparation of metallic sulphate
    - by treating metals with sulphuric acid
    - by treating the oxides, hydroxides, carbonates and sulphides of metals with sulphuric acid
    - by double decomposition (preparation of insoluble sulphates)
    - by roasting of sulphides
  - General properties of metallic sulphates
    - action with water
    - action of heat
- Chemistry of metallic chlorides
  - General methods of preparation of metallic chlorides (hydrated)
    - by treating metals with hydrochloric acid
    - by treating the oxides, hydroxides, carbonates and sulphides of metals with hydrochloric acid
    - by double decomposition (preparation of insoluble chlorides)
    - by treating metals with aqua regia
  - General properties of metallic chlorides
    - action with water
    - action of heat

        - action with acid
- Chemistry of metallic nitrate
    - General methods of preparation of metallic nitrate
        - by treating metals with nitric acid
        - by treating the oxides, hydroxides and carbonates of metals with nitric acid
        - by double decomposition
    - General properties of metallic nitrate
        - action with water
        - action of heat

2.2 Alkali metals **[2 Hrs.]**

- Introduction
- Periodic position
- General characteristic properties of alkali metals (ref. physical and chemical properties)
    - Physical properties:
        - Physical appearance, size of atoms, melting and boiling point, oxidation state, metallic character and electronegativity
    - Chemical properties:
        - Action of air, action of water, action with hydrogen, action with halogen
- Sodium
    - Introduction
    - Physical Properties
    - Chemical properties:
        - action with air, water, hydrogen, hydrogen chloride, ammonia, chlorine, Sulphur, carbon dioxide
        - reducing action
    - uses

2.3 Alkaline earth metals **[2 Hrs.]**

- Introduction
- Periodic position
- General characteristic properties of Alkaline earth metals (ref. physical and chemical)
    - Physical properties:
        - Physical appearance, size of atoms, melting and boiling point, oxidation state, metallic character and electronegativity
    - Chemical properties:
        - Action with air, water, hydrogen, nitrogen, halogen, acids, non-metals
        - formation of alloys
- Distinguish between alkali and alkaline earth metals
- Calcium
    - Introduction
    - Physical Properties
    - Chemical properties:
        - action with oxygen, water, hydrogen chloride, sulphuric acid, hydrogen, nitrogen, chlorine, carbon
    - uses

2.4 Coinage metals **[2 Hrs.]**

- Introduction
- Periodic position

- General characteristic properties of coinage metals (ref. physical and chemical properties)
  - Physical properties:
    - Physical appearance, size of atoms, melting and boiling point, malleability, ductility, conductivity, variable valency
  - Chemical properties:
    - Action with air, water and acids
    - Action of salt solution with metals like Zn, Mg, and Fe
    - Formations of alloys
- Copper
  - Introduction
  - Physical properties
  - Chemical properties:
    - action with air, water, acids, ammonia, chlorine, Sulphur
    - reducing action
    - displacement reaction
  - uses

2.5 Aluminum [1 Hr.]

- Introduction
- Physical Properties
- Chemical properties:
  - action with air, water, Nitrogen, chlorine, carbon, Sulphur, acids, sodium hydroxide
- uses

2.6 Zinc [1 Hr.]

- Introduction
- Physical Properties
- Chemical properties:
  - action with oxygen (philosopher's wool), water, sodium hydroxide, acids, chlorine, Sulphur
  - displacement reaction
- uses

2.7 Iron [1 Hr.]

- Introduction
- Physical Properties
- Chemical properties:
  - action with air, water, chlorine, acids, Sulphur, carbon monoxide
  - displacement reaction
- uses

2.8 Lead [1 Hr.]

- Introduction
- Physical Properties
- Chemical properties:
  - action with air, water (plumbosolvency), acids, chlorine, Sulphur, sodium hydroxide, acetic acid
- uses

Unit3: Organic compounds and polymers [15 Hrs.]

3.1Organic compounds [5 Hrs.]

- Introduction
- vital force theory and downfall of vital force theory
- Classification of organic compounds
- Functional groups
- Homologous series
  - Definition
  - Characteristics of homologous series
- Nomenclature of organic compounds
- Concept of word root, suffix and prefix
- IUPAC naming of simple aliphatic compounds:
  - alkane, alkene, alkyne, halogen derivatives (monohalo only), alcohol, (monohydric alcohol only), ethers, aldehydes, ketones, carboxylic acid (mono carboxylic acid), nitroalkane, alkyl cyanides, alkyl isocyanides, amines
- writing the simple structural formula from the name of the compound (IUPAC)

3.2 Alkanes **[2 Hrs.]**

- Introduction
- Hydrocarbon
  - Aliphatic hydrocarbon
    - saturated and unsaturated hydrocarbon
  - aromatic hydrocarbon
- Methane
- Introduction
- Physical properties
- Chemical properties
  - halogenation, nitration, action with air and steam, pyrolysis
- uses

3.3 Alkene **[2 Hrs.]**

- Introduction

Ethylene

- Physical properties
- Chemical properties:
  - addition reaction
    - addition of hydrogen, halogens, hydrogen chloride, water, sulphuric acid,
    - ozonolysis
    - Markonikov's rule and peroxide effect
  - oxidation reaction
    - with alkaline $KMnO_4$, with acidified $KMnO_4$, oxidation by air
  - polymerization
- uses

3.4 Alkyne **[2 Hrs.]**

- Introduction
- Acetylene
- Physical properties
- Chemical properties:
  - Addition reaction
    - addition of hydrogen, halogens, halogens acid water, sulphuric
    - acid, hydrogen cyanides, acetic acid
    - Ozonolysis
  - Substitution reaction

        - action with sodium, ammoniacal silver nitrate, ammoniacal cuprous chloride
    - Oxidation reaction
        - with alkaline KMnO4, with chromic acid, oxidation by air
    - Polymerization
- uses

3.5 Benzene **[3 Hrs.]**

- Introduction
- Distinguish between aliphatic and aromatic compounds
- Aromaticity
- Huckel rule
- Physical properties of benzene
- Chemical properties of benzene:
    - Substitution reaction
        - Halogenations, nitration, Sulphonation, Friedel craft reaction
    - Addition reaction
        - Addition of hydrogen halogens and ozone
    - Oxidation reaction
        - action with air and combustions
- uses

3.6 Polymers **[1Hr]**

- Introduction
- Polymers and polymerization
- Classification of polymer:
    - natural polymer
    - synthetic polymer
- Polythene
    - preparation and uses
- Polyvinyl chloride
    - preparation and uses
- Rubber
    - preparation and uses of natural rubber (ref. isoprene unit) and synthetic rubber (ref. Neoprene rubber)

Tutorial

Unit 1: **[14hrs]**

Practice on causes, types and method of removal of hardness of water, Lab preparation of ammonia, chlorine, hydrogen chloride, hydrogen sulphide, Manufacture of ammonia, nitric acid and sulphuric acid, nitrogen cycle and chemical fertilizers, oxides of nitrogen and Sulphur as pollutant and acid rain, chemical properties of ammonia, nitric acid, chlorine, hydrogen chloride, hydrogen sulphide and sulphuric acid, allotropes of carbon, structure and properties of Diamond.

Unit 2: **[9 Hrs.]**

Practice on difference metals and non-metals, preparation and properties of metallic carbonate, chlorides, sulphate and nitrates, types and purpose of making of alloys, general characteristics of alkali metals, alkaline earth metals and coinage metals, chemical properties of different metals like sodium, calcium, aluminium, copper, Zinc, iron and lead

Unit 3: **[7 Hrs.]**

Practice on homologues series, functional group, IUPAC naming of simple aliphatic compounds, saturated and unsaturated hydrocarbon, chemical properties of methane, alkene,

alkyne and benzene, Huckel's rule, homopolymers and copolymers, preparation and uses of polyethene, polyvinyl chloride and rubber.

Engineering Chemistry Practical II: [30 Hrs.]

1. Prepare and study the properties of hydrogen gas. [2hrs]
2. Prepare and study the properties of ammonia gas. [2hrs]
3. Prepare and study the properties of hydrogen Sulphide gas. (This gas should not be prepare individually in woulf bottle but in Kipp's apparatus commonly) [2hrs]
4. Detect the acid radicals (Cl^-, NO_3^{--}, SO_4^{---}, CO_3^{--}) by dry and wet ways. (4hrs)
5. Detect the basic radicals (Cu^{++}, Al^{+++}, Fe^{+++}, Zn^{++}, CO^{++}, Ni^{++}, Ca^{++}, Ba^{++}, Mg^{++}) by wet ways. [6hrs]
6. Detect the acid and basic radicals (complete salt analysis). [6hrs]
7. Investigate the action of acids on some metals (Zn, Mg, Fe, Al, Sn& Cu) (acids: HCl, H_2SO_4(dil.) & HNO_3 (dil.) [2hrs]
8. Compare the hardness of different types of water. [2hrs]
9. Prepare Bakelite (resin) in the laboratory. [2hrs]
10. Determine the condition in which corrosion takes place. [2hrs]

References Books:

1. Foundations of chemistry, Vol-2, M.K. Sthapit and R.R. Pradhananga, Taleju prakashan, Kathmandu
2. A Text book of Engineering Chemistry-vol II, Prakash Paudel, Siddthartha publication, Kathmandu
3. Engineering Chemistry, M.L. Sharma, K.M. Shrestha, P.N. Choudhary, Ekta Book,
4. A Text book of Chemistry, Jha and Guglani, surya publication, India
5. Elementary qualitative analysis, M.K. Sthapit and C.B. Tuladhar, Taleju Prakashan
6. Elementary practical chemistry, MK. Sthapit, Taleju Prakashan
7. Practical engineering chemistry for diploma level, Sumitri Bajracharya, Sabina Shrestha, Kathmandu institute of technology.

Other learning materials:

1. Other references to be selected by the related lecturer(s) from among the texts available in the market that meet the content needs of this subject.
2. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed as a textbook of this subject.

Evaluation Scheme

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the questions will be as indicated as in the table below.

Units	Chapter	Hours	Marks distribution
1	Water	5	4
	Ammonia	4	4
	Nitric acid	8	8
	Halogens (Chlorine),	3	4
	Hydrochloric acid, Hydrogen sulphide	4	4
	Sulphuric acid, Carbon and its compound	7	8
2	General study of metals and their components: Alloys	5	4
	Alkali metals, sodium, Aluminium	3	4
	Alkaline earth metals, calcium, Zinc	3	4
	Coinage metals, copper, Iron, lead	4	4
3	Organic compounds, alkane	6	4
	Alkene, Alkyne	4	4
	Benzene, polymer	4	4
	Total	**60**	**60**

Note: There may be minor deviation in marks distribution. Choice question can be asked from different chapters.

Workshop Practice I
EG 1201 CE

Year: I **Total: 8hours /week**
Semester: II **Lecture: 2 hours/week**
Tutorial: hours/week
Practical: 6 hours/week
Lab: hours/week

Course description:
This course intends to impart basic knowledge and skills on electricity and bench works.

Course objectives:
After the completion of this course students will be able to:
1. Define electricity;
2. Familiarize with metal works;
3. Perform house wiring works.
4. Perform simple metal works.

Part I: Electricity

Total: 4hours /week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 3 hours/week

Course description:
This part of the course focuses on familiarization of electricity and its application. It intends to impart knowledge and skills on Electrical accessories, Electrical energy, Electric symbols, House appliances and building wiring.

Course objectives:
After the completion of this course, students will be able to:
1. Define electricity;
2. Identify electric symbols and accessories;
3. Identify tools/equipment and its safety requirement of wiring system;
4. Identify major components of electrical system and its installation procedure and
5. Connect lighting circuits and signal circuits.

Course Contents:

Theory

Unit 1: Electricity **[1 Hr.]**
- 1.1. Introduction
- 1.2.History of electricity
- 1.3.Generation of electricity
- 1.4.Scope of electricity
- 1.5.Types of current

Unit 2: Fundamentals of electric circuits **[4 Hrs.]**
- 2.1.Definition of voltage, current, resistance and their relationship
- 2.2.Types of conductors

2.3.Types of circuits
- 2.3.1. Series circuit
- 2.3.2. Parallel circuit

2.4 Measurement of current, voltage, resistance and power
- 2.4.1. Ampere meter
- 2.4.2. Volt meter
- 2.4.3. Ohm meter
- 2.4.4. Power meter/ Watt meter/Energy meter

2.5 Related numerical problems on circuits

Unit 3: Electrical Energy Transformation **[2 Hrs.]**

3.1.Transformer, its function and application
3.2.Isolator, its function and application
3.3.Electric poles, its function and application
3.4.Safety and precautions

Unit 4: Measuring Instruments and Protecting Devices **[1 Hr.]**

4.1.Foot and meter/scale (Linear measuring instruments)
4.2.Vernier caliper/caliper
4.3.Standard wire gauge
4.4.Feeler gauge/radius gauge
4.5.Micrometer/voltmeter
4.6.Miniature Circuit breaker (MCB)
4.7.Fuses and fuse types
4.8.Check line with color chalk dust powder
4.9.Straightedge and line

Unit 5: Source of Power **[2 Hrs.]**

5.1.Definition
5.2.D.C. system
5.3.A.C. system
5.4.Phases (single and three phases lines)
5.5.Inverter system
5.6.Solar power system

Unit 6: Electric Symbols **[1 Hr.]**

6.1.Introduction
6.2.Types of symbols
6.3.Identification
6.4.Application

Unit 7: Earthing **[2 Hrs.]**

7.1.Definition of electric shock
7.2.Effects of electric shock on human body
7.3.Levels of electric shock
7.4.Introduction of earthing
7.5.Function and application
7.6.Earthing methods and testing
7.7.Safety and precaution in earthing

Unit 8: Electric Wiring Procedure **[2 Hrs.]**

8.1.Marking procedure and interpolation of wiring diagram
8.2.Setting out back ground on wall surface
8.3.Drilling holes for fixing wire and cables and switch boxes
8.4.Fixing accessories components or position
8.5.Installation of wires/cables to masonry wall by placing safety foundation
8.6.Fixing PVC insulated wires and cables branching boxes using clips and saddles
8.7.Fixing accessories on position

Practical

Project 1: Draw/interpret Drawings and Diagrams: [5 Hrs.]

1.1 Simple electrical drawings
1.2 Free hand plan/schematic diagram
1.3 Layout diagram
1.4 Wiring diagram.

Project 2: Connect the following Lighting Circuits on Board: [32 Hrs.]

2.1.One-way switch one light and one socket [4 Hrs.]
2.2.Two-way switch two lights and two sockets [5hrs]
2.3. Intermediate switches, two fluorescent lamps [5 Hrs.]
2.4.Multi-position switches and incandescent lamps [7 Hrs.]
2.5.Dimmer switches and incandescent lamps. [7 Hrs.]
2.6.Time switches and lamps [4 Hrs.]

Project 3: Connect the following Signal Circuits: [8 Hrs.]

3.1.Electrical bell [2 Hrs.]
3.2.Electric door opener [3 Hrs.]
3.3. Ceiling fan with fan regulator [3 Hrs.]

References:

1. Malla, N.B., (latest edition). Introduction of Electricity volume 1.
2. Malice, S. K., (latest edition). Electric Trade Theory and Practical.

Evaluation Scheme

S.N.	Description	Time (hours)	Marks
1	Draw/Interpret drawings and diagrams	5	5
2	Connect lighting circuits on boards	32	25
3	Connect the signal circuits	8	5
4	Viva from theory		5
	Total		40

Part II: Bench work

Total: 4hours /week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 3 hours/week

Course Description:
This part of the course focuses on familiarization of bench work and its application. It intends to impart knowledge and skills on bench works techniques and metal tools making procedures.

Course Objectives:
After the completion of this course, students will be able to:

1. Introduce bench work;
2. Identify bench work tools and its types;
3. Classify the various techniques of metal joining processes by hand
4. Prepare general types of tools and equipment
5. Handle measuring instruments, hand tools, power tools with personal safety

Course Contents:

Unit 1: Bench work [1 Hrs.]

1.1 Introduction
1.2 Importance and its Application in Engineering work
1.3 Safety measures used in workshop

Unit 2: Lying Tools [2 Hrs.]

2.1 Introduction of layout tools: (scriber, punch, divider, surface plate, v-block, Vernier calliper and Vernier height gauge)
2.2 Types of layout tools
2.3 Handling procedure of layout tools
2.4 Repair and maintenance of the layout tools
2.5 Hammer/Hammering
  2.5.1 Introduction of the ball, cross, straight, claws and soft hammers.
  2.5.2 Selection of hammer for driving, chipping, punching, puling nails, riveting and fitting.
  2.5.3 Holding and replacing handle.
  2.5.4 Handling of hammering tools.
2.6 Wrenches
  2.6.1 Introduction to single, double, pipe and the adjustable wrenches
  2.6.2 Handling of wrenches
  2.6.3 Identification of bench, machine, pipe and chain vices.

Unit 3: Cutting tools [4 Hrs.]

3.1 Chisels
- Introduction to cross diamond and round chisels
- Selecting the angle of the chisels and removing metal from the surface
- Holding the hammer and chisel and chipping processes.
- Uses of the chipping guard, care and maintenance of work place and tools.

3.2 Handsaw and sawing
- Selection of hand saw, blade, cutting metal.
- Method of the holding the work piece and rules of sawing.

3.3 Files and filing
- Identification of the parts, shapes, sizes, cuts of the files.

- Selection of file for the shaping different types of the metal and surface finish with accuracy of +-0.2mm.
- Method of the holding, balancing and the direction of the filing

3.4 Reamer and reamering

- Types of the reamers, hand, taper and adjustable reamers
- Selection of holding device, reamer; drill speed.
- Method of reamering on the metal

3.5 Thread and threading

- Introduction to taps, dies, handle kinds of the thread, size, angle, main part of the thread and uses.
- Method of producing the thread by the taps and dies, lathe machine, rolling, pressing

3.6 Scraper and scraping

- Identification of flat, three side and curve scraper
- Method of the scraping and the qualities of the surface

Unit 4: Measuring instrument [1 Hr.]

4.1 Identification of Vernier calliper, micrometre, try square, bevel protractor, wire, and filler radius and thread gauge.

4.2 Parts of measuring instrument

4.3 Rules of the measuring instrument.

Unit 5: Rivet and Riveting [1Hr]

5.1 Identification of rivets, size, head, metal, riveting sets punches.

- Calculation of length, diameter of rivet and head.
- Procedure of the riveting and the joints mistakes.

Unit 6: Solder and Soldering [1 Hr.]

6.1 Introduction to soldering iron, types of solder, cleaning tools and the fluxes.

- Selection of source of heat and temperature
- Process of cleaning and joining work metal

Unit 7: Shear and shearing [1 Hr.]

- Identification of hands, press, torch, snip, shear tools.
- Selection of method of the shearing sheet, rod, and square, flat angle metal

Unit 8: Bend and bending [1 Hr.]

- Introduction to bending devices, vice pliers, range, hand bar and fork
- Selection of folding, radius bending and rolling devices
- Method of bending the metal bar, flat and the plate
- Bending the metal into many shapes

Unit 9: Power tools [2 Hrs.]

9.1 Drill machines

- Identification of hand drill machine, bench, gang, colon and radial drill machine.
- Selection of correct type of the machine
- Correct method of using the drilling machine
- Selection of correct speed and the fit for different size of the drill and the metal

9.2 Drill and drilling

- Identification of different kinds of drill size, purpose and angle
- Selection of work and drill, holding tools and equipment

- Operation of all types of drill machine of the drill holes of acceptable standards.
- Operation of the drill machines and the functioning by coolant

Unit 10: The sheet metal work **[1 Hr.]**

10.1 Hand tool metal

- Identification of types of the sheet metal, mild steel, galvanized steel, copper, brass, aluminum familiar with sizes and thickness of the sheet metals.
- Measurement of the sheet with gauge and instruments.

10.2 Marking tools

- Identification and uses of sheet metal marking tools, scriber, rules, try square, punch, divider, trammel and depth gauge.
- Selection of marking and sheet metal tools and uses such as the hand snipes, stacks, punch plat, hatchet, blow horn, hand punch, pop riveters fork devices, hammers, fly cutter, groove, seaming tools.

10.3 Power tools

- Identification of bending, rollers, folders, and edge forming, sawing, crimping, spot welding and polishing parts

Practical:

1. Perform straight, curve and dot marking: [1 Hr.]
2. Measure with rules, Vernier caliper, gauge [1 Hr.]
3. Perform hammering by ball, cross and soft straight pin. [1 Hr.]
4. Perform sawing by power hand saw. [2 Hrs.]
5. Perform filing with single, double and rasp cut. [2 Hrs.]
6. Perform chiseling by the flat, cross, concave and power chisel. [2 Hrs.]
7. Perform hand and adjustable reamering. [2 Hrs.]
8. Perform threading with tap and dies. [2 Hrs.]
9. Perform flat and curve scrapping on the metal surface [1 Hr.]
10. Perform riveting with riveting sets pup riveter [2 Hrs.]
11. Operate power tools for drilling, folding, rolling, radius bending, spot welding, grinding, beading, crippling, edge forming, hacksaw machines. [5 Hrs.]
13. Make hammer by using the skill of measuring, marking, sawing, filing, drilling, thread cut using a Tool steel 1 pc of size 25x25x155mm [12 Hrs.]
14. Make store box by using the skill of measuring, marking, hemming, seaming, cutting, folding, riveting using a G.I. sheet 22 gauge of 400x500 mm [12 Hrs.]

References:

1. Rajput, R.K., (latest edition). Manufacturing process.
2. Chaudhary, S.K., Chaudhary, A.K., Roy, N., (2007). Workshop technology manufacturing processes (Vol -1), Media Promoters &Publishers Pvt. Ltd.

Evaluation Scheme

S.N	Description	Time (hours)	Marks
1	Perform marking and measurement	2	4
2	Perform hammering or sawing	3	4
3	Perform filing or chiseling	4	8
4	Perform reamering or threading	4	8
5	Perform scrapping or riveting	3	4
6	Operate power tools	5	8
7	Viva from theory		4
	Total		40

Engineering Drawing II
EG 1201 AR

Year: I **Total: 4 hours /week**
Semester: II **Lecture: hours/week**
Tutorial: hours/week
Practical: 4 hours/week
Lab: hours/week

Course description:
This course is designed to impart knowledge and skills on drawing pictorial view (in isometric and oblique) of the solid, surface development and intersection between two elements.
Instructors are requested to manage and deliver the related theoretical contents at drawing room just before conducting the specific practical work. All the theoretical and practical classes should be conducted with in total time of 60 Hours as allotted.

Course objectives:
After the completion of this course, students will be able to:
1. Analyze/ draw the different orthographic projections;
2. Analyze/draw the different pictorial projections;
3. Draw surface development and
4. Analyze/ draw intersection.

Course Contents:

Theory

Unit 1. Axonometric Projection: **[0.5 Hr.]**
- 1.1. Types of axonometric projection,
- 1.2. Introduction of axonometric projection
- 1.3. Isometric and oblique projection.

Unit 2. Oblique Drawing: **[0.5 Hr.]**
- 2.1. Oblique drawing
- 2.2. Measurement in receding axis
- 2.3. Rules for placing object in oblique (box method)
- 2.4. Cavalier and Cabinet projection
- 2.5. Making of Angle, Circular arc in oblique drawing

Unit 3. Isometric Drawing: **[0.5 Hr.]**
- 3.1 Isometric scale
- 3.2 Angle of receding axis
- 3.3 Isometric drawing and isometric projection
- 3.4 Isometric and Non-isometric line
- 3.5 Making of angle, circular arc in isometric view

Unit 4. Projection of True length and shape of oblique line and shape: **[0.5 Hr.]**
- 4.1. Introduction of oblique line
- 4.2. True length and angle to HP/VP of oblique line
- 4.3. True shape of oblique plane
- 4.4. Revolving method
- 4.5. Replacing Method

Unit 5. Projection of intersection of line and plane **[1 Hr.]**
- 5.1. Method of finding of intersection point
- 5.2. Method of finding the seen and hidden part of line

5.3. Method of finding the angle between plane and line

Unit 6. Projection of Intersection plane and plane: [0.5 Hr.]

6.1. Line of intersection
6.2. Seen and hidden part of plane
6.3. Finding the dihedral angle between two planes

Unit 7. Projection of points and line on the surface of geometrical solids: [0.5 Hr.]

7.1. Finding the points and lines by generating method
7.2. Finding the points and line by cutting plane method

Unit 8. Projection of intersection between line and geometrical solids: [0.5 Hr.]

8.1. Projection of piercing point by generating method
8.2. Projection of piercing point by cutting plane method

Unit 9. Section: [0.5 Hr.]

9.1. Introduction of section and its needed
9.2. Sectional plane and sectional views
9.3. Projection of sectional views
9.4. Type of section- Longitudinal and cross section- Full section, half section, offset section, detail section etc.

Unit 10. Projection of intersection between planes and simple geometrical solids and its Surface development with true shape of cut portion: [0.5 Hr.]

10.1. Introduction sectional plane and solid
10.2. Understanding the development of surfaces
10.3. Method of development
10.4. Method for development of cut surfaces

Unit 11. Projection of intersection between surfaces of solids: [1.5 Hrs.]

11.1. Introduction about surfaces of solids
11.2. Type of cutting plane (Vertical/Horizontal projecting plane)
11.3. Determination of line/curve of intersection
11.4. After the intersection of two solids that shape will be occurring of touched at touched portion

Practical (Class work sheet)

Sheet No 1: [10 Hrs.]

1. Make the oblique view using by models or work pieces.
2. Make oblique view by six models on flat or inclined surfaces.
3. Make oblique view by six models on round and inclined/ flat surfaces.

Sheet No 2: [10 Hrs.]

1. Make the isometric view by models or work pieces.
2. Make oblique view by six models on flat or inclined surfaces.
3. Make oblique view by six models on round and inclined/ flat surfaces.

Sheet No 3: [3 Hrs.]

1. Find the true length of oblique line by revolving method. (At least three exercise on true length by revolving method)
2. Find the true shape of oblique plane (Triangle) by replacing (Auxiliary view) method

Sheet No 4: [3 Hrs.]

1. Perform projection drawing of intersection of line a triangular plane showing the point of intersection,

2. Draw true shape of plane and angle between plane and line on the edge of given plane (At least two exercises should be done).

Sheet No 5: **[3 Hrs.]**

Perform projection drawing of intersection plane and plane (two triangular planes) showing line of intersection and dihedral angle between two planes. (At least three exercises should be done).

Sheet No 6: **[1 Hr.]**

1. Perform projection drawing of pyramid and cone with line(s) and point(s) of the surface finding in HP or VP as missing in one plane.

Sheet No 7: **[3 Hrs.]**

1. Perform projection drawing of full section and half sectional view of model which has through hole (At least two exercises should be done of this topic).

Sheet No 8: **[2 Hrs.]**

1. Draw intersection between line and cylinder, pyramid cone, and sphere, showing the piercing points.

Sheet No 9: **[10 Hrs.]**

1. Perform/draw square prism, pentagonal prism, hexagonal prism, cylinder and cone cut by a vertical projecting plane (Inclined to HP and perpendicular to VP) with true shape.
2. Perform/draw square, pentagonal, hexagonal, base pyramid, cone and sphere cut by a vertical projecting plane (inclined to HP and perpendicular to VP) with true shape.
3. Exercise on above mentioned pyramid and cone cut by a horizontal projecting plane (inclined to VP and perpendicular to HP)
4. Perform/draw surface development of prism (Triangular, square, pentagonal, hexagonal base), cylinder at simple position (uncut state).
5. Perform/draw surface development of pyramid and cone after the cut by sectional plane (truncated solid).

Sheet No 10: **[8 Hrs.]**

Perform/draw projection drawing of intersection of two surfaces of two solids (intersection of two solids) on:

1. Vertical (right) prism and horizontal prism of different size.
2. Vertical (right) cylinder and horizontal cylinder of different size.
3. Vertical (right) cylinder and horizontal prism.
4. Vertical (right) cone and prism.
5. Vertical (right) cone and cylinder.
6. Vertical (right) pyramid and prism.

References:

1. Luzzadar W. I Fundamental of Engineering drawing. Prentice-Hall of India.
2. S. Bogolyubov and A. Voinov, Engineering drawing. Mir Publishers, Moscow.
3. S. K Bogolyubov, Exercises in Machine Drawing. Mir publishers, Moscow.
4. K. Venugopal Engineering Drawing and Graphics, New age international (p) Ltd. India.
5. Gill P. S. Engineering Drawing, S. K. Kataria and sons India.
6. M. B. Shah and B.C. Rana, Engineering Drawing, Pearson India.
7. N. D. Bhatta and Panchal V.M. Engineering Drawing Charotar publishing House India.

Applied Mechanics
EG 2102 CE

Year: I **Total: 6 hours /week**
Semester: II **Lecture: 3 hours/week**
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2/2 hours/week

Course Description:
This course focuses on analysis and effect of various types of forces on the particle and rigid body at rest. The course familiarizes with the frictional phenomenon on engineering problems. It includes the evaluation of properties of plane bodies as center of gravity and moment of inertia. The course focuses on the analysis of internal forces/stresses in beams and trusses.

Course Objectives:
After the completion of this course, students will be able to:
1. Understand the basic laws of motion, vector and its laws, concept of particle and rigid body and application of equations of static equilibrium;
2. Describe the different types of forces that may act on the body, resolve the forces; determine resultant of a given force system;
3. Understand the laws of friction forces, be familiar with the frictional force on the body and analysis of typical problems;
4. Be familiar with the distributed forces (Centre of gravity, Centroid, Moment of Inertia) and be able to determine CG and MI for simple plane and solid figures;
5. Be familiar with structures (beam and truss), support systems, loading systems, be able to evaluate the reactions and forces in the truss members;

Course Contents:

Theory

Unit 1: Introduction: Forces Acting on Particle and Rigid Body [6 Hrs.]

1.1 Definition of Mechanics and scope of Applied Mechanics
1.2 Concept of Particle, Rigid Body, Deformable Body
1.3 Review of vectors and its laws;
1.4 Definition of a force, units, representation by a vector and by Bow's notation, Characteristics of a Force and its Effects,
1.5 Classification of Forces Based to Plane and Line of Action: Internal, External, Translational, Rotational, Coplanar, Non-Coplanar, Concurrent, Non-Concurrent, Like Parallel and Unlike Parallel Forces.
1.6 Resolution and Composition of Forces: Methods of resolution, Perpendicular Components and Non-Perpendicular Components,
1.7 Principle of Transmissibility of Forces
1.8 Resolution of a Force in to a Force and a Couple
1.9 Moment of a Force: Definition, Measurement of Moment of a Force, Units, Geometrical Interpretation of Moment, Classification of Moments According to Direction of Rotation, Sign Convention, Law of Moments, Varignon's Theorem of Moment and its Application,
1.10 Couple: Definition, Units, Measurement of a Couple, Properties of Couple, its use.

Unit 2: Equilibrium of Forces: [8 Hrs.]

2.1 Conditions of Equilibrium for a Particle and Rigid Body;
2.2 Analytical and Graphical Conditions of Equilibrium for Concurrent, Non-Concurrent and Parallel Force System;
2.3 Free Body Diagrams, Construction of Free Body Diagrams
2.4 Equations of Static Equilibrium: Two and Three Dimensional analysis of Particle, Two Dimensional analysis of Rigid Body
2.5 State and Prove: Triangle Law of Forces, Parallelogram law of Forces
2.6 Polygon Law of Forces and Lami's Theorem, Application of Lami's Theorem to Solve Various Problems.
2.7 Equivalent Forces: Definition of Equilibrant, Differentiate Resultant and Equilibrant,
Equilibrant of Concurrent and Non-Concurrent force System.
2.8 Resultant and Equilibrium of Moments and Couples

Unit 3: Friction: [5 Hrs.]

3.1 Friction: Definition, Causes, Advantages, Disadvantages, Types, and Force of Friction.
3.2 Laws of Friction: Static and Dynamic Friction and Their Coefficients
3.3 Different status (No Friction, Certain Friction, Impending Motion and Motion)
3.4 Sliding and Tipping Condition of the Body
3.5 Angle of Friction and its Meaning, Angle of Repose, Relation between Angle of Friction Angle of Repose and Coefficient of Friction.
3.6 Equilibrium of Bodies on Level Plane; Equilibrium of Bodies on Inclined Plane:
3.7 External Forces Parallel to the Plane, External Forces in Inclined Plane.

Unit 4: Centre of Gravity (CG) and Centroid: [5 Hrs.]

4.1 Concept of Centre of Gravity, Center of Mass, Centroid (Plane Figures), Axis of Symmetry,
4.2 Centroid of Composite lines (straight line, arc, semicircle and quarter circle)
4.3 Centroid of Composite Figures (Rectangle, Triangle, Circle/Semi-circle/Quarter circle /Circular sector, Parabola/Semi-parabola and Ellipse)
4.4 Centroid of Area under curve by the method of Integration
4.5 Centroid of Built-up Plane Figures
4.6 Center of Gravity of Simple Solids: Cylinder, Sphere, Hemisphere, Cube, Cone and Rectangular Block (Ready to use formulae).

Unit 5: Moment of Inertia (MoI): [7 Hrs.]

5.1 Concept of Moment of Inertia, First Moment and Second Moment of Area
5.2 Axial and Polar Moment of Inertia
5.3 Moment of Inertia of Regular Areas (Rectangle, Triangle, Circle and Ellipse) about their Centroidal axes
5.4 Perpendicular and Parallel axis Theorems for Moment of Inertia
5.5 Moment of Inertia of Composite Area
5.6 Radius of Gyration
5.7 Application of Moment of Inertia in Engineering Problems
5.8 Concept of Principal Moment of Inertia and Application in Engineering Problems.
5.9 MoI of L, T, I- and channel sections. Section modulus

Unit 6: Analysis of Statically Determinate Beams: [3 Hrs.]

6.1 Definition of Structure and Mechanism
6.2 Plane and Space Structures
6.3 Determinacy and Stability (Static and Geometric) of the Structures. Degree of freedom.
6.4 Different types of Load and Support in the Structures
6.5 Definition and Types of Beam
6.6 Calculation of Support Reactions: Examples on Beams, Trusses, Links and Beams with Internal Hinge

Unit 7: Axial Force, Shear Force and Bending Moments [6 Hrs.]

7.1 External and internal forces (Axial Force, Shear Force, and Bending Moment) in the Structural Members: Definition of Axial Force (AF), Shear Force (SF) and Bending Moment (BM), Sign Convention and Calculations and Plotting.
7.2 Concept of Superposition of AF, SF and BM in Beams.
7.3 Relationship between Load, Shear Force and Bending Moment
7.4 Calculations of AF, SF and BM and Draw Corresponding Diagrams for Cantilever, Simply Supported and Overhanging Beams Subjected to Uniformly Distributed Load (UDL), Concentrated and Uniformly Varying Load (UVL).

Unit 8: Analysis of Statically Determinate Plane Truss [5 Hrs.]

8.1 Concept and definition of Trusses, Joints Formation and Load Transfer Mechanisms in the Truss. Classification: Prefect, imperfect, redundant and deficient, relation between members and joints, assumption in the analysis.
8.2 Types of Truss Based on Their Uses
8.3 Calculation of Member Force by the Method of Joints: Examples with Merits and Demerits.
8.4 Calculation of Member Force by the Method of Sections: Examples with Merits and Demerits.

Tutorials: [30 Hrs]

Assist students for conceptual & critical problem solving

1. Problems on vectors addition, subtraction, multiplication, projection of vectors and components
2. Problems on characteristics of force and their effects on rigid bodies
3. Resolution of forces into different components
4. Simple problems on transmissibility of forces
5. Problems on parallel forces, couples and moments
6. Equilibrium of forces: Problems related to triangle law of forces, parallelogram law of forces polygon law of forces and Lami's theorem. Equilibrium of concurrent, non-concurrent and parallel force system. Resultant and equilibrant force. Moments, couples, resultant of parallel forces and moments.
7. Problems related to equilibrium of bodies on level plane; equilibrium of bodies on inclined planes considering frictional forces and external forces parallel to the plane, inclined to the plane.
8. Problems related to CG composite lines: straight line, arc, semicircle and quarter circle. CG of composite figures: Rectangle, triangle, circle/semi-circle/quarter circle/circular sector, parabola/semi-parabola and ellipse. CG of Area under curve by the method of integration.

9. Problems related to MoI of regular areas: Rectangle, triangle, circle/semi-circle/quarter/circle and ellipse. Perpendicular and parallel axis theorems. MoI of simple composite areas.
10. Problems on reactions of beams, trusses, links in beams, beams with internal hinge, portal frame.
11. Problems on calculations of AF, SF, BM and plotting for cantilever, simply supported, overhanging beams subjected to UDL, Concentrated and UVL.
12. Problems related to calculation of member force by the method of joints in simple trusses. Determination of member force by the method of sections for simple trusses.

Practical (Laboratory) [15 Hrs]

1. Verify Triangle law of forces, Parallelogram law of forces and Lami's theorem
2. Verify Principle of Moments
3. Determine Centroid of Plane Figures (Rectangle, Triangles, Circle and Ellipse, L-Section, I-Section)
4. Determine Moment of Inertia by Flywheel
5. Determine Support Reactions of Simply Supported and Cantilever Beam with different types of Loading
6. Determine Support Reactions and Member Force of Simply supported Truss
7. Determine shear force at different sections on a simply supported beam under points loads
8. Determine bending moment at different sections on a simply supported beam under different types of loading.

Textbooks:

1. R. S. Khurmi, "*Applied Mechanics and Strength of Materials"*, Nirja Construction and Development Pvt. Ltd., Ram Nagar, New Delhi
2. F. P. Beer & E. R Johnston Jr, "*Vector Mechanics for Engineers - Statics*", McGraw-Hill
3. I. H. Shames, "*Engineering Mechanics - Statics and Dynamics*", New Delhi, Prentice Hall of India
4. R. C. Hibbeler, "*Engineering Mechanics*", McMilan Publishing Company, New York

References:

1. M. R. Dhital, "*A Course Manual on Applied Mechanics I (Statics)",* IOE, Pulchowk Campus
2. R. Suwal, "*A Text Book of Applied Mechanics"*, R & R Engineering Consultancy Pvt. Ltd

Evaluation Scheme

Unit	Chapters	Hours	Marks
1	Introduction: Forces Acting on Particle and Rigid Body	6	12
2	Equilibrium of Forces	8	16
3	Friction	5	8
4	Centre of Gravity (CG) and Centroid	5	8
5	Moment of Inertia (MoI)	7	12
6	Analysis of Statically Determinate Beams	3	4
7	Axial Force, Shear Force and Bending Moments	6	12
8	Analysis of Statically Determinate Plane Truss	5	8
Total		**45**	**80**

Experts Involved

- प्रा. डा. ज्ञान बहादुर थापा, बिषय बिज्ञ, Mathematics, IOE, Pulchock Campus, काठमाण्डौं।
- श्री बिनय देवकोटा, बिषय बिज्ञ, Physics, BSET, काठमाण्डौं।
- श्री सुदन भक्त अधिकारी, बिषय बिज्ञ, Mathematics, काठमाण्डौं।
- श्री भवानि प्रसाद अधिकारी, बिषय बिज्ञ, Physics, काठमाण्डौं।
- श्री प्रकाश पौडेल, बिषय बिज्ञ, Chemistry, काठमाण्डौं।
- श्री टिकाहरि बराल, विषय बिज्ञ, नेपाली, नोभल कलेज, काठमाण्डौ।
- श्री परशुराम घिमिरे, विषय बिज्ञ, English, कामना कलेज, काठमाण्डौं।
- श्री दिपक भट्ट, बिषय बिज्ञ, BSET, काठमाण्डौं ।
- श्री गोर्कण बहादुर मोत्रा, बिषय बिज्ञ, IOE पुल्चोक, ललितपुर ।

CURRICULUM

DIPLOMA

Computer Engineering

(Three-year program-semester system)

Council for Technical Education and Vocational Training

Curriculum Development and Equivalence Division

Sanothimi, Bhaktapur

2001

First Revision 2002

Second Revision 2010

Third Revision 2018

Fourth Revision 2022

Contents

Introduction

This three years Diploma in Computer Engineering curriculum is designed to produce middle level skilled technician updated with latest skills of computer and information technology with a view to cope with the emerging technological change. Many people in the developed, developing and under developed countries have been given emphasis for the broader application of computer. Computer Engineering has been contributing the world for the overall development and creating job or employment opportunities in both public and private sectors.

This curriculum is designed to foster knowledge and skills to the technician required by the computer engineering and information technology related industries and organizations in Nepal. The Diploma in Computer Engineering program extends over three years. Each year is divided into two semesters. There are six semesters in total within the period of three years.

The first-year courses include the basic science subjects like physics, chemistry, and mathematics applicable in the field of computer Engineering. It also includes language subjects like Nepali and English applicable for the communication in the field of computer engineering. The second-year courses focus on the basic disciplinary subjects of computer engineering. Similarly, third year courses comprise of the disciplinary subjects and the application of learned skills and knowledge by making the provision of major and minor projects as well as elective subjects in the specific areas of computer engineering.

The course structure and the subject-wise contents that follow reflect the details of this curriculum. In short, this curriculum guides its implementers to produce competent and highly employable middle level technical human resources in the field of computer engineering.

The contents of each subject prescribed in the curriculum are incorporated in the light of "must to know and must to do" principle. The contents of the curriculum are minutely describing in micro level.

Rationale of Revision

Diploma in Computer Engineering curriculum was developed in 2001. This is the fourth revision after the implementation of its development. The rationales behind its revision are as follows:

- The implementing agencies/college have requested to revise this curriculum based on their teaching experiences.
- All Diploma level Engineering Courses' first and second semester subjects are re-adjusted and are common.
- The semester-wise re-adjustments of the existing subjects are felt necessary.
- It is needed to revisit its weightage in both theory and practical marks contents to make it more practical oriented.
- The technologies invented in this field seems necessary to be incorporated.

Furthermore, technicians are projected to grow faster than the average for all occupations. Jobs for Diploma in Computer Engineering are projected to increase at a faster-than-average rate. To cope with the national and international demands, the knowledge and skills of this curricular program should be updated to make the skills relevant and pertinent to the related computer engineering sector.

Curriculum Title
Diploma in Computer Engineering.

Aim
The program aims to produce mid-level technical human resource equipped with knowledge and skills in allied field of study.

Objectives
The curriculum has following objectives:

1. To produce middle level competent technical workforce/human resources that could provide services to the public and private organizations in the field of Computer.
2. To prepare such technicians who are able to work in public and private organizations in general communication, banking and business sectors in particular.
3. To prepare such technical workforce who will demonstrate positive attitude and respect for the profession and socio-cultural values.
4. To help in meeting the demand of such technical workforce required for the public and private organizations of Nepal.
5. To reduce the dependence on employing such technicians from foreign countries.
6. To create self-employment opportunities immensely.

Group Size
The group size is a maximum of 48.

Entry Qualification

- SLC pass or SEE or equivalent with minimum C Grade (2.0 Grade Point) in Mathematics and Science and 1.6 Grade Point or equivalent in English and as per the provisions mentioned in the admission guidelines of Office of the Controller of Examinations, CTEVT.
- Pre-diploma in related subject or equivalent with minimum 68.33%.
- Pass entrance examination administered by CTEVT.

Duration
The total duration of this curricular program is three academic years [six semesters]. The program is based on semester system. Moreover, one semester consists of 19.5 academic weeks including evaluation period. Actual teaching learning Hrs. will be not less than 15 weeks in each semester.

Medium of Instruction
The medium of instruction will be in English and/or Nepali.

Pattern of Attendance
Minimum of 90% attendance in each subject is required to appear in the respective final examination.

Teacher (Instructor) and Student Ratio
The ratio between teachers and students must be:

- Overall ratio of teacher and student must be 1:12 (at the institution level)
- 1:48 for theory and tutorial classes
- 1:12 for practical/demonstration

- 1:8 for bench work
- 75 % of the technical teachers must be full timer

Qualification of Instructional Staff

- The program coordinator should be a master's degree holder in the related subject area.
- The disciplinary subject related teachers should be a bachelor's degree holder in the related subject area.
- The demonstrators should be a bachelor's degree holder or diploma or equivalent with 3 years' work experience in the related subject area.
- The foundational subject related teacher (refer to course codes SH and MG) should be master's degree holder in the related subject area.

Instructional Media and Materials

The following instructional media and materials are suggested for the effective instruction and demonstration.

- ***Printed media materials:*** Assignment sheets, case studies, handouts, performance checklists, textbooks etc.
- ***Non-project media materials:*** Displays, models, photographs, flipchart, poster, writing board etc.
- ***Projected media materials****:* Slides, Multimedia Projector.
- ***Audio-visual materials:*** Audiotapes, films, slide-tapes, videodisc, etc.
- ***Computer based instructional materials:*** Computer based training, interactive video etc.
- **Web-Based Instructional Materials** (Online learning)
- **Radio/Television/Telephone**
- **Education-focused social media platform**

Teaching Learning Methodologies

The methods of teaching will be a combination of several approaches, such as Illustrated talk, Lecture, Tutorial, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Report writing, Term paper presentation, Case analysis, Tutoring, Role-playing, Heuristic, Project work and Other Independent learning.

- Theory: Lecture, Discussion, Seminar, Interaction, Assignment, Group work.
- Practical: Demonstration, Observation, Guided practice, Self-practice, Project work.
- Internship: Industrial practice

Approach of Learning

There will be inductive, deductive and learner-centered approaches of learning.

Examinations and Marking Scheme

a. Internal assessment

- There will be a transparent/fair evaluation system for each subject in both theory and practical exposure.
- Each subject will have internal assessment at regular intervals and students will get the feedback about it.
- Weightage of theory and practical marks are mentioned in curriculum structure.

- Continuous assessment format will be developed and applied by the evaluators for evaluating student's performance in the subjects related to the practical experience.

b. Final examination

- Weightage of theory and practical marks are mentioned in structure.
- Students must pass in all subjects both in theory and practical for certification. If a student becomes unable to succeed in any subject, she/he will appear in the re-examination administered by CTEVT.
- Students will be allowed to appear in the final examination only after completing the internal assessment requirements.

c. Requirement for final practical examination

- Professional of relevant subject teacher must evaluate final practical examinations.
- One evaluator in one setting can evaluate not more than 20 students.
- Practical examination should be administered in actual situation on relevant subject with the provision of at least one internal evaluator from the concerned constituent or affiliated institute led by external evaluator nominated by CTEVT.
- Provision of re-examination will be as per CTEVT policy.

d. Final practicum evaluation will be based on:

- Institutional practicum attendance - 10%
- Logbook/Practicum book update - 10%
- Spot performance (assigned task/practicum performance/identification/arrangement preparation/measurement) - 40%
- Viva voce:
    - Internal examiner - 20%
    - External examiner - 20%

e. Pass marks:

- The students must secure minimum 40% marks in theory and 50% marks in practical. Moreover, the students must secure minimum pass marks in the internal assessment and in the yearly final examination of each subject to pass the subject.

Provision of Back Paper

There will be the provision of back paper but a student must pass all the subjects of all year within six years from the enrollment date; however, there should be provision of chance exam for final year students as per CTEVT rules.

Disciplinary and Ethical Requirements

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by the review of the disciplinary review committee of the institute.
- Dishonesty in academic or practical activities will result in immediate suspension followed by administrative review, with possible expulsion.
- Illicit drug use, bearing arms in institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

Grading System

The grading system will be as follows:

Grading	Overall marks
• Distinction:	80% and above
• First division:	65% to below 80%
• Second division:	50% to below 65%
• Pass division:	Pass marks to Below 50%

Certificate Awarded

- Students who pass all the components of all subjects of all six semesters are considered to have successfully completed the course.
- Students who successfully complete the curricular program will be awarded with a degree of **"Diploma in Computer Engineering"**

Career Path

The graduates will be eligible for the position equivalent to non-gazette 1st class/Level 5 (technical) as prescribed by the Public Service Commission of Nepal and other related agencies.

General Attitudes Required

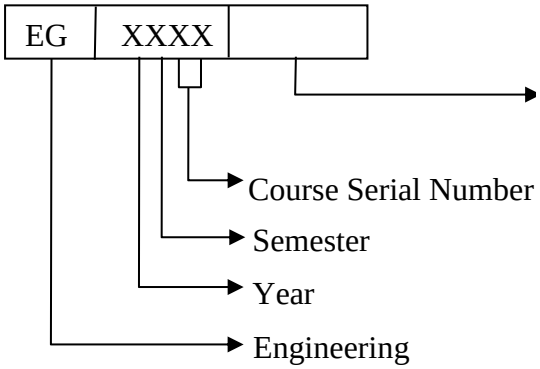
A student should demonstrate following general attitudes for effective and active learning. Acceptance, Affectionate, Ambitious, Aspiring, Candid, Caring, Change, Cheerful, Considerate, Cooperative, Courageous, Decisive, Determined, Devoted, Embraces, Endurance, Enthusiastic, Expansive, Faith, Flexible, Gloomy, Motivated, Perseverance, Thoughtful, Forgiving, Freedom, Friendly, Focused, Frugal, Generous, Goodwill, Grateful, Hardworking, Honest, Humble, Interested, Involved, Not jealous, Kind, Mature, Open minded, Tolerant, Optimistic, Positive, Practical, Punctual, Realistic, Reliable, Distant, Responsibility, Responsive, Responsible, Self-confident, Self-directed, Self-disciplined, Self-esteem, Self-giving, Self-reliant, Selfless, Sensitive, Serious, Sincere, Social independence, Sympathetic, Accepts others points of view, Thoughtful towards others, Trusting, Unpretentiousness, Unselfish, Willingness and Work-oriented.

Provision of Elective Subjects

There will be a provision of one for each elective I and elective II subjects in the third year/first part and third year/second part of this curriculum respectively. Subjects of Computer Engineering discipline such as Geographical Information System, E-commerce, Management Information System, E-governance, Computer Simulation and Modeling and Artificial Intelligence is offered as an elective. Forty percent students out of total number of enrolled students should be maintained in elective subject.

Subjects Codes

Each subject is coded with a unique number preceded and followed by certain letters as mentioned in following chart:



Offering Departments:

AE: Automobile Engineering

AGE: Agricultural Engineering

AR: Architecture Engineering

BM: Biomedical Engineering

BM: Biomedical Equipment Engineering

CE: Civil Engineering

CT: Computer Engineering

EE: Electrical Engineering

EEX: Electrical & Electronics Engineering

EX: Electronics Engineering

GE: Geomatics Engineering

HE: Hydropower Engineering

IT: Information Technology

ME: Mechanical Engineering

MG: Management

Curriculum Structure
Diploma in Computer Engineering

Year: I **Part: I**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final Marks	Final Time (Hrs.)	*Assmt. Marks	Final Marks	Final Time (Hrs.)		
1	EG1101SH	Applied Nepali	4				4	4	20	80	3				100	*Continuous assessment
2	EG1102SH	Applied English	4				4	4	20	80	3				100	
3	EG1103SH	Engineering Mathematics I	4	2			6	4	20	80	3				100	
4	EG1104SH	Engineering Physics I	4	2		2	8	5	20	60	3	10	10	2	100	
5	EG1105SH	Engineering Chemistry I	4	2		2	8	5	20	60	3	10	10	2	100	
6	EG1101AR	Engineering Drawing I	1		4		5	3	0	0		60	40	4	100	
7	EG1101CT	Computer Application	2		2		4	3	10	40	1.5	30	20	3	100	
		Total	**23**	**6**	**6**	**4**	**39**	**28**							**700**	

Year: I **Part: II**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final Marks	Final Time (Hrs.)	*Assmt. Marks	Final Marks	Final Time (Hrs.)		
1	EG1201SH	Engineering Mathematics II	4	2			6	4	20	80	3				100	*Continuous assessment
2	EG1202SH	Engineering Physics II	4	2		2	8	5	20	60	3	10	10	2	100	
3	EG1203SH	Engineering Chemistry II	4	2		2	8	5	20	60	3	10	10	2	100	
4	EG1201CE	Workshop Practice I	2		6		**8**	5	0	0		60	40	4	100	
5	EG1201AR	Engineering Drawing II	0		4		4	2	0	0		60	40	4	100	
6	EG1202CE	Applied Mechanics	3	2		2/2	6	4	20	60	3	20	0		100	
		Total	**17**	**8**	**10**	**5**	**40**	**25**							**600**	

Year: II **Part: I**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final		*Assmt. Marks	Final			
										Marks	Time (Hrs.)		Marks	Time (Hrs.)		
1	EG2101SH	Engineering Mathematics III	3	1			4	3	20	80	3				**100**	*continuous assessment
2	EG2101CT	C programming	4			3	7	6	20	80	3	30	20	3	**150**	
3	EG2102CT	Web Technology I	3	1		3	7	5	20	80	3	30	20	3	**150**	
4	EG2103CT	Digital Logic	3			2	5	4	20	80	3	30	20	3	**150**	
5	EG2104CT	Discrete Structure	3	1			4	3	20	80	3				**100**	
6	EG2105CT	Software Engineering	3			2	5	4	20	80	3	30	20	3	**150**	
7	EG2106CT	Basic Electrical and Electronics Engineering	3	1		3	7	5	20	80	3	30	20	3	**150**	
		Total	**22**	**4**		**13**	**39**	**30**							**950**	

Year: II **Part: II**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final		*Assmt. Marks	Final			
										Marks	Time (Hrs.)		Marks	Time (Hrs.)		
1	EG2201CT	Database Management System	3	1		2	6	4	20	80	3	30	20	3	**150**	*continuous assessment
2	EG2202CT	Data Structure and Algorithm	3	1		3	7	5	20	80	3	30	20	3	**150**	
3	EG2203CT	Object Oriented Programming in Java	4	1		3	8	6	20	80	3	30	20	3	**150**	
4	EG2204CT	Microprocessor and Computer Architecture	3	1		3	7	5	20	80	3	30	20	3	**150**	
5	EG2205CT	Web Technology II	3	1		3	7	5	20	80	3	30	20	3	**150**	
6	EG2206CT	Statistics and Probability	3	1			4	3	20	80	3				**100**	
		Total	**19**	**6**		**14**	**39**	**28**							**850**	

Year: III **Part: I**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final		*Assmt. Marks	Final			
										Marks	Time (Hrs.)		Marks	Time (Hrs.)		
1	EG3101CT	Computer Graphics	3	1		2	6	4	20	80	3	30	20	3	**150**	*continuous assessment
2	EG3102CT	Data Communication and Network	3	1		3	7	5	20	80	3	30	20	3	**150**	
3	EG3103CT	Operating System	3			2	5	4	20	80	3	30	20	3	**150**	
4	EG3104CT	Computer Repair and Maintenance	2			3	5	4	10	40	1.5	30	20	3	**100**	
5	EG3105CT	Data Mining and data warehousing	3			3	6	5	20	80	3	30	20	3	**150**	
6		Elective – I	3	1		3	7	5	20	80	3	30	20	3	**150**	
	EG3106CT.1	a) Geographical Information System														
	EG3106CT.2	b) E-commerce														
	EG3106CT.3	c) Management Information System														
7	EG3107CT	Minor Project			3		3	2				60	40	3	**100**	
		Total	**17**	**3**	**3**	**16**	**39**	**29**							**950**	

Year: III **Part: II**

S.N.	Code No.	Subject	Teaching Scheme						Examination Scheme DISTRIBUTION OF MARKS						Total Marks	Remarks
			Mode				Weekly Hours	Credit Hours	Theory			Practical				
			L	T	P	Lab			*Assmt. Marks	Final		*Assmt. Marks	Final			
										Marks	Time (Hrs.)		Marks	Time (Hrs.)		
1	EG3201CT	Multimedia System	3	1		2	6	4	20	80	3	30	20	3	**150**	*continuous assessment
2	EG3202CT	Internet of Things	3	1		3	7	5	20	80	3	30	20	3	**150**	
3	EG3203CT	Information Security	3			2	5	4	20	80	3	30	20	3	**150**	
4	EG3201MG	Entrepreneurship Development	3		2		5	4	20	60	3	10	10	2	**100**	
5		Elective – II	3	1		3	7	5	20	80	3	30	20	3	**150**	
	EG3204CT.1	a) E-Governance														
	EG3204CT.2	b) Computer Simulation and Modeling														
	EG3204CT.3	c) Artificial Intelligence														
6	EG3205CT	Major Project			8		8	**4**				120	80		**200**	
		Total	**15**	**3**	**10**	**10**	**38**	**26**							**900**	

First Year (First and Second Semesters)

[See Separate Curriculum]

([Year I Part I and Year I Part II) Engineering All

Second Year/ First Part

S.N.	Course Code	Subject
1	EG2101SH	Engineering Mathematics III
2	EG2101CT	C programming
3	EG2102CT	Web Technology I
4	EG2103CT	Digital Logic
5	EG2104CT	Discrete Structure
6	EG2105CT	Software Engineering
7	EG2106CT	Basic Electrical and Electronics Engineering

Engineering Mathematics III

EG2101SH

Year: II **Total: 4 Hrs./week**

Part: I **Lecture: 3 Hrs./week**

Tutorial: 1 Hrs./week

Practical: Hrs./week

Lab: Hrs./week

Course Description:

This course consists of five units namely: Applications of derivatives, Partial derivatives, application of Anti-derivatives, Differential equations and Fourier series; which are basically necessary to develop mathematical knowledge and helpful for understanding as well as practicing their skills in the related engineering fields.

Course Objectives:

On completion of this course, students will be able to understand the concept of the following topics and apply them in the related fields of different engineering areas: Applications of derivatives and anti-derivatives, Partial derivatives, differential equations and Fourier series.

Course Contents:

Theory

Unit 1. Applications of Derivatives [12 Hrs.]

1.1. Derivatives of inverse circular functions and hyperbolic functions
1.2. Differentials, tangent and normal
1.3. Maxima and minima, concavity, increasing and decreasing functions
1.4. Rate measures
1.5. Indeterminate forms: $\frac{0}{0}$, $\frac{\infty}{\infty}$ and $\infty - \infty$, L'Hospital's Rule (without proof)

Unit 2. Partial Derivatives [6 Hrs.]

2.1. Functions of more than two variables
2.2. Partial derivative from First principles
2.3. Partial derivatives of First and higher orders
2.4. Euler's theorem for function of two variables
2.5. Partial derivatives of composite functions

Unit 3. Applications of Anti-derivatives [8 Hrs.]

3.1. Standard Integrals, related numerical problems
3.2. Basic idea of curve sketching**:** odd and even functions, periodicity of a function, symmetry (about *x*-axis, *y*-axis and origin), monotonicity of a function, sketching graphs of polynomial, trigonometric, exponential, and logarithmic functions (simple cases only)
3.3. Area under a curve using limit of sum (without proof)
3.4. Area between two curves (without proof)
3.5. Area of closed a curve (circle and ellipse only)

Unit 4. Differential Equations [14 Hrs.]

4.1. Ordinary Differential Equations (ODEs)
  4.1.1. Definitions, order and degree of differential equation
  4.1.2. Differential equation of First order and First degree
  4.1.3. Variable separation and variable change methods

4.1.4. Homogeneous and linear differential equation of First order
4.1.5. Exact differential equation, condition of exactness
4.1.6. Simple applications of First order differential equations

4.2. Partial Differential Equations (PDEs)
4.2.1. Basic concepts, definition and formation
4.2.2. General solution of linear PDEs of first order (Pp + Qq = R form)

Unit 5. Fourier Series **[5 Hrs.]**

5.1. Periodic functions and fundamental period of periodic functions
5.2. Odd and even functions with their properties
5.3. Trigonometric series
5.4. Fourie's series in an interval of period 2π (arbitrary range is not required)

Tutorial: **[15 Hrs.]**

1. Applications of Derivatives [4 Hrs.]
2. Partial Derivatives [2 Hrs.]
3. Applications of Anti-derivatives [3 Hrs.]
4. Differential Equations [5 Hrs.]
5. Fourier Series [1 Hrs.]

Evaluation Scheme:

Unit wise Marks division for Final

S. No.	Units	Short questions (2 marks)	Long questions (4 marks)	Total Marks
1	Applications of Derivatives	4 x 2 = 8	3 x 4 = 12	20
2	Partial Derivatives	2 x 2 = 4	2 x 4 = 8	12
3	Applications of Anti-derivatives	3 x 2 = 6	3 x 4 = 12	18
4	Differential Equations	4 x 2 = 8	4 x 4 = 16	24
5	Fourier Series	1 x 2 = 2	1 x 4 = 4	6
		14 x 2 = 28	**13 x 4 = 52**	**80**

References:

1. Thapa et al., Engineering Mathematics (Volume I, Three Years Diploma), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
2. Bajracharya et al., Basic Mathematics (Grade XI/XII), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
3. Kryszig E., Advanced Engineering Mathematics, wile-Easter Publication, New Delhhi, India
4. Nath et al., Engineering Mathematics III, Vidhyarthi Publisher & distributors, Kathmandu, Nepal
5. Other references selected by the related lecturer(s) from among the texts available in the market that meet the content of this subject.

C Programming
EG2101CT

Year: II **Total: 7 hours /week**
Part: I **Lecture: 4 hours/week**
Tutorial: hour/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course deals with the problem-solving techniques using C programming language. It provides the students with the knowledge of the basic features of the C language such as data types, keywords, operators, control structure, array, String handling functions, functions, structure and union, pointer and file handling.

Course objectives:
After completion of this course students will be able to:
1. Implement fundamentals concepts of programming language.
2. Apply sequential, conditional and looping statements while developing programs.
3. Create modular programs using array.
4. Make and apply programs using function, strings, string handling function, structure and union, pointer and data files.

Course Contents:

Theory

Unit 1. Programming Language Fundamentals [6 Hrs.]
- 1.1. Introduction to Program and Programming Language
- 1.2. Types of Programming Language (Low Level and High-Level Language)
- 1.3. Language Translator (Assembler, Compiler and Interpreter)
- 1.4. Program Error, Types of Error (Syntax, Semantic, Runtime Error)
- 1.5. Program Design Tools (Algorithm, Flowchart)

Unit 2. Introduction to C [8 Hrs.]
- 2.1. Overview and History of C
- 2.2. Features, Advantages and Disadvantages of C
- 2.3. Structure of C Program, Compiling Process
- 2.4. Character set used in C, Data types, Variables. C Tokens (Keywords, Identifier, Constants, Operators), Header files, Library function
- 2.5. Preprocessor Directives, Escape Sequence, Comments
- 2.6. Input Output Operation
  - 2.6.1. Formatted input/output function (printf(), scanf())
  - 2.6.2. Unformatted input/output function (getchar(), putchar(), gets(), puts(), getc(), putc())

Unit 3. Operators and Expressions [4 Hrs.]
- 3.1. Operators, Operand, Operation, Expression
- 3.2. Types of Operators (Unary, Binary, Ternary, Arithmetic, Relational, Logical, Assignment, Increment/Decrement, Conditional, Bitwise, Size-of Operators)

Unit 4. Control Structure/Statement [12 Hrs.]
- 4.1. Sequential Statement
- 4.2. Decision/Selection/Conditional Statement
  - 4.2.1. if statement

4.2.2. if…else statement
4.2.3. if…else if…else statement
4.2.4. Nested if…else statement
4.2.5. Switch statement
4.3. Loop (for, while and do-while)
4.4. Jump statement (break, continue, goto statement)

Unit 5. Array and String **[8 Hrs.]**

5.1. Introduction to Array, Declaration, Initialization
5.2. Types of Arrays (1-D Array, Multi-dimensional Array)
5.3. String, Array of String
5.4. String Handling Function (strlen(), strrev(), strupr(), strlwr(), strcpy(), strcat(), strcmp())

Unit 6. Function **[6 Hrs.]**

6.1. Introduction
6.2. Function components (function declaration, function call, function definition)
6.3. Types of function (library/built-in function and user-defined function)
6.4. Category of function according to return value and arguments
6.5. Parameter passing in C (call by value and call by reference)
6.6. Recursion (recursive function)
6.7. Passing array to function
6.8. Passing string to function

Unit 7. Structure and Union **[6 Hrs.]**

7.1. Structure: definition, declaration, initialization, size of structure
7.2. Accessing member of Structure
7.3. Array of Structure
7.4. Nested Structure
7.5. Union: definition, declaration, size of union
7.6. Structure Vs. Union

Unit 8. Pointer **[4 Hrs.]**

8.1. Introduction to Pointer
8.2. Address (&) and indirection (*) operator
8.3. Pointer Arithmetic Operations
8.4. Pointer to Pointer in C
8.5. Dynamic Memory Allocation (malloc(), calloc(), realloc(), free())

Unit 9. Data files **[6 Hrs.]**

9.1. Introduction to data files
9.2. Types of files (text file, binary file)
9.3. File handling operation
9.4. Opening and closing file
9.5. Creating file
9.6. Library functions for READING from a file and WRITING to a file: (fputs, fgets, fputc, fgetc fprintf, fscanf)

Practical: **[45 Hrs.]**

1. Write programs to implement sequential structure.

2. Write programs to implement conditional structure.
3. Write programs to implement looping structure.
4. Write programs to implement array and string handling function.
5. Write programs to implement library function, user defined function and recursive function.
6. Write programs to implement structure and union.
7. Write programs to implement pointer.
8. Write programs to read from a file and write to data file using fputs, fgets, fputc, fgetc fprintf, fscanf function.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Programming Language Fundamentals	6	8
2	Introduction to C	8	11
3	Operators and Expressions	4	5
4	Control Structure/Statement	12	16
5	Array and String	8	11
6	Function	6	8
7	Structure and Union	6	8
8	Pointer	4	5
9	Data files	6	8
	Total	**60**	**80**

* There may be minor deviation in marks distribution.

References:

1. Gotterfried, B. (2001). Programming with C. (3rd ed.). India: Mcgraw Hill Education.
2. Bhatta, R.D. (2015). A Text Book of C Programming. (3rd ed.). Nepal: Vidyarthi Pustak Bhandar.
3. Thareja, R. (2015). Introduction to C Programming. (2nd ed.). India: Oxford University Press.
4. Kantekar, Y. (2012). Let us C. (10th ed.). India: BPB Publications.
5. Balagurusamy, E. (2008). Programming in ANSI C. (6th ed.). India: The McGraw Hill Companies.

Web Technology I

EG2102CT

Year: II **Total: 7 hours/week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course is designed to provide skills to the student to develop modern web application and gain a broad understanding of the Web Technology. This course focuses on the development of dynamic web contents and applications to facilitate information distribution. The course will initiate students to the different web development tools and technology such as HTML, HTML 5, CSS, JavaScript and GUI based tools.

Course objectives:

After completion of this course students will be able to:

1. Familiarize with the basic technique of web technology and web page design
2. Use recent web development software to develop dynamic web contents and applications
3. Design the client-side web site with features of control of client side.

Course Contents:

Theory

Unit 1. Internet & Web [5 Hrs.]

1.1. History of Internet and Web
1.2. Uses of Internet and Services
1.3. Introduction to WWW
1.4. Component of WWW (Web, Webpage, Website, Homepage, Web Browsers, Web Servers, URL and Search Engines)
1.5. Types of Web Pages & its Processing in WWW
1.6. Internet protocols (TCP/IP, ARP, HTTP, FTP, SMTP, POP, SNMP) and applications

Unit 2. Hypertext Markup Language (HTML) [15 Hrs.]

2.1. Introduction to HTML
2.2. Basic Structure of HTML (HTML, HEAD, TITLE, BODY)
2.3. BODY Attributes (Forecolor: TEXT and Background color: BGCOLOR, Background Image, Background Sound)
2.4. HTML Elements
2.5. HTML TAGS and Attributes
  2.5.1. Singular Tags
  2.5.2. Paired Tags
2.6. Character formatting
  2.6.1. Heading Tag (H1 to H6) and attribute (ALIGN)
  2.6.2. Paragraph Tag and attribute (ALIGN)
  2.6.3. Line Break (BR)
  2.6.4. Horizontal Rule (HR) and attribute (ALIGN, SIZE, WIDTH, NOSHADE)
  2.6.5. Comment in HTML (<!>)
  2.6.6. Text Formatting (B, I, U, BLOCKQUOTE, Q, PREFORMATTED, SUB, SUP, EM, STRIKE, SMALL, BIG, CENTER)
2.7. FONT tag and Attributes (COLOR, FACE and SIZE)

2.8. List Tags and Attributes
  2.8.1. Ordered List: OL, LI, and OL Attributes (TYPE - 1, I, i, A, a, START, VALUE)
  2.8.2. Unordered List: UL, LI, and UL Attributes (TYPE- Disc, Circle, Square)
  2.8.3. Definition List: DL, DT, DD
2.9. Inserting IMAGES and OBJECTS
  2.9.1. Images: IMG; Attributes (ALIGN, SRC, WIDTH, HEIGHT, ALT, BORDER)
  2.9.2. Objects: OBJECT; Attributes (DATA, WIDTH, HEIGHT)
2.10. MARQUEE tag and attributes
2.11. HYPERLINK and Anchor Tag
  2.11.1. Creating Internal Links: Links to other places in the same HTML documents
  2.11.2. Creating Local Links: Link to other HTML documents or data objects
  2.11.3. Creating Global Links: Links to places in other HTML documents
  2.11.4. Anchor Tag and Hyperlink<A HREF TARGET>and<A NAME>
  2.11.5. Creating Image Links
2.12. TABLE Tag
  2.12.1. Creating TABLE, TR, TH and TD and attributes (ALIGN, CELLSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER)
2.13. FRAME and FRAMESET Tags
  2.13.1. FRAMESET tag and Attributes (ROWS, COLS and Absolute dimensions, Percentage dimensions, Relative dimensions)
  2.13.2. FRAME tag and Attributes (SRC, NAME, MARGIN HEIGHT, MARGIN WIDTH, SCROLLINGAUTONORESIZE)
  2.13.3. NOFRAMES tag
2.14. HTML FORM
  2.14.1. FORM tag and attributes (METHOD, ACTION, TARGET)
  2.14.2. INPUT element and attributes (TYPE – TEXT, PASSWORD, CHECKBOX, HIDDEN, IMAGE, FILE, RANGE, RADIO, RESET, SUBMIT, BUTTON; VALUE, SRC, CHECKED, SIZE, MAXLENGTH, ALIGN)
  2.14.3. SELECT, OPTION Tag and attributes (NAME, SIZE, MULTIPLE / SINGLE, SELECTED)
  2.14.4. TEXT AREA Tag and attributes (ROWS, COLS, READ ONLY, DISABLED)

Unit 3. HTML 5 and Features [5 Hrs.]

3.1. Introduction
3.2. Difference between HTML and HTML 5
3.3. HTML 5 New Semantics Elements (HEADER, FOOTER, SECTION)
3.4. HTML 5 New Elements
  3.4.1. Tables, Images, Colors, Canvas, Forms
  3.4.2. Interactive Elements
  3.4.3. Graphics
  3.4.4. Multimedia

Unit 4. HTML Editors and Tools [5 Hrs.]

4.1. Introduction to HTML Editors and HTML Converters
4.2. HTML Editors and tools
  4.2.1. Use of different HTML editors and tools like Dreamweaver, Microsoft Front Page Notepad++, etc.
4.3. Graphical and Animation Tools
  4.3.1. Use of different graphical and animation tools like Adobe Photoshop, MS Paint, Flash, etc.
  4.3.2. Adding Sounds and Animation to the web page (using embed tag)

Unit 5. Cascading Style Sheet (CSS) [5 Hrs.]

5.1. Introduction to Cascading Style Sheets (CSS) and advantages of using CSS
5.2. Basic Syntax
  5.2.1. Creating Cascading Style Sheets (CSS) using STYLE tag
5.3. Types of Style Sheets
  5.3.1. Inline Style Sheets
  5.3.2. Internal/ Embedded Style Sheets
  5.3.3. External Style Sheets
5.4. Introduction to different Styles and their Attributes
  5.4.1. Backgrounds and Color Styles and Attributes
  5.4.2. Fonts and Text Styles and Attributes
  5.4.3. Margin, Padding and Border Styles and Attributes
  5.4.4. List Styles and Table Layouts
  5.4.5. Additional Features - Grouping Style Sheets, Assigning Classes and Span
  5.4.6. DIV Tag
  5.4.7. Responsive Web Design

Unit 6. Introduction to Server Side and Client-Side Scripting [2 Hrs.]

6.1. Overview of Server Side and Client-Side Scripting
6.2. Difference between Server Side and Client-Side Scripting
6.3. Advantages and Disadvantages of Server Side and Client-Side Scripting

Unit 7. JavaScript [8 Hrs.]

7.1. Overview of JavaScript
7.2. Advantages of JavaScript
7.3. Implementing JavaScript code to HTML page using SCRIPT tag
7.4. Variables in JavaScript
7.5. JavaScript Data Type-Variant subtypes
7.6. JavaScript Functions
7.7. Event Handling and JavaScript objects
7.8. Document Object Model in JavaScript
  7.8.1. Browser Objects and Events
  7.8.2. Document Objects and Events
  7.8.3. Form Objects and Events
7.9. Dialog Box supported by JavaScript
7.10. Form validation

Practical: [45 Hrs.]

1. Design a simple page using Character formatting i.e. (Heading Tag (H1 to H6), Paragraph Tag, Line Break, Horizontal Rule, Text Formatting (B, I, U, SMALL, BIG,

EM, SUB, SUP, PRE, STRIKE, CENTER and BLOCKQUOTE) and also use FONT tag and Attributes (COLOR, FACE and SIZE) using HTML.

2. Demonstrate the use of different LIST and their attributes using HTML.
3. Demonstrate the use of TABLE (use ALIGN, CELLSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER attributes) using HTML.
4. Demonstrate the use of HYPERLINK (use internal link, local link, global link and image link) in HTML.
5. Create a page containing 3 FRAMES with 1st frame covering 40% of the screen (vertical coverage) and remaining screen should be horizontally divided into 2 frames (40% and 60%). The 1st frame should contain a banner image and 2nd frame contains the links (i.e. link1 and link2) and the links of these items must be opened in the 3rd frame. Use FRAMESET and FRAME tags of HTML to create the pages.
6. Design a FORM containing username, password, radio button, checkbox, drop-down menu, textarea (for comment section), submit button, and reset button using HTML.
7. Demonstrate the use of different types of CSS in HTML.
8. Demonstrate the use of class and div tags in HTML.
9. Demonstrate the use of JavaScript code to the html page.
10. Develop a simple web site with different simple web pages.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Internet & Web	5	10
2	Hypertext Markup Language (HTML)	15	24
3	HTML 5 and Features	5	8
4	HTML Editors and Tools	5	8
5	Cascading Style Sheet (CSS)	5	10
6	Introduction to Server Side and Client-Side Scripting	2	5
7	JavaScript	8	15
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Bayross, Ivan (New Edition), HTML, DHTML, JavaScript & PHP, BPB publications
2. Kamal Raj, “Internet & Web Design”, Tata McGraw Hill Wiley, Chris Bates, Web programming Dreamtech India Pvt. Ltd
3. Keith Jeremy, “HTML5 for Web Designers”

Digital Logic
EG2103CT

Year: II **Total: 5 hours/week**
Part: I **Lecture: 3 hours/week**
Tutorial: hour/week
Practical: hours/week
Lab: 2 hours/week

Course Description:
This course introduces logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of digital signal, number system, logic gates, minimization techniques, and combinational as well as sequential circuits and concludes with digital logic families and digital displays.

Course Objective:
After completing this course, the students will be able to:
1. Design the combinational logic circuits
2. Explain the sequential logic circuits
3. Design problem based / predefined logic-based circuits

Course Contents:

Theory

Unit 1. Introduction to Digital Signal **[3 Hrs.]**
- 1.1. Analog Signal and Digital Signal
- 1.2. Advantages of Digital over Analog Signals
- 1.3. Representation of Digital Signal
- 1.4. Applications of Digital Signal

Unit 2. Number Systems and Codes **[4 Hrs.]**
- 2.1. Two State Devices
- 2.2. Decimal Number System
- 2.3. Binary Number System
- 2.4. Octal Number System
- 2.5. Hexadecimal Number System
- 2.6. Conversions among Different Number Systems
- 2.7. Fractions Conversion
- 2.8. BCD Code
- 2.9. Gray Code
- 2.10. Alphanumeric Code
  - 2.10.1. ASCII Code
  - 2.10.2. EBCDIC Code

Unit 3. Arithmetic Logic Operations **[5 Hrs.]**
- 3.1. Binary Arithmetic
  - 3.1.1. Binary Addition
  - 3.1.2. Binary Subtraction
- 3.2. r's Complement and (r-1)'s Complement Method for decimal and binary system

Unit 4. Logic Gates and Boolean Function **[10 Hrs.]**
- 4.1. Basic Gates: AND, OR, NOT
- 4.2. Universal Gates: NAND, NOR
- 4.3. Exclusive Gates: XOR, XNOR

4.4. DeMorgan's Theorems
4.5. The Universal Properties of the NAND Gates
4.6. The Universal Properties of the NOR Gates
4.7. Pulse Operation in Logic Gates
4.8. Combination of Logic Gates
4.9. Boolean Algebra and its Properties/Laws
4.10. Boolean Expression in Logic Gates
4.11. Simplification of Boolean Expressions

Unit 5. Logic Simplification [5 Hrs.]

5.1. Karnaugh Map
  5.1.1. K-Map Simplification for Two Input Variables
  5.1.2. K-Map Simplification for Three Input Variables
  5.1.3. K-Map Simplification for Four Input Variables
5.2. Sum of Product (SOP) Simplification
5.3. Product of Sums (POS) Simplification
5.4. K-Maps with *Don't Care* Conditions

Unit 6. Combinational Logic Circuits [8 Hrs.]

6.1. Half Adder, Full Adder and Parallel Adder
6.2. Half Subtractors and Full Subtractors
6.3. Decimal to Binary Encoder and Decimal to BCD Encoder
6.4. Binary to Decimal Decoder, BCD to Decimal Decoder and Seven Segment Display Decoder
6.5. Data Transmissions, 4-to-1 Multiplexer and 8-to-1 Multiplexer
6.6. Demultiplexer and Decoder Relations
6.7. 1-to-4 Demultiplexer and 1-to- 16 Demultiplexer

Unit 7. Sequential Logic Circuits [8 Hrs.]

7.1. Flip-Flops
  7.1.1. RS Flip-Flop and its Truth Table
  7.1.2. D Flip-Flop and its Truth Table
  7.1.3. JK Flip-Flop and its Truth Table
  7.1.4. T Flip-Flop and its Truth Table
  7.1.5. Master-Slave Flip-Flops
  7.1.6. Applications of Flip-Flop
7.2. Shift-Registers
  7.2.1. Flip-flop as a One-bit Memory Device
  7.2.2. Arithmetic Right/Left Shift Registers
  7.2.3. Serial-in Serial-out (SISO) Shift Register
  7.2.4. Serial-in Parallel-out (SIPO)Shift Register
  7.2.5. Parallel-in Serial-out (PISO)Shift Register
  7.2.6. Parallel-in Parallel-out (PIPO)Shift Register
  7.2.7. Applications of Shift Registers
7.3. Counters
  7.3.1. Synchronous Counters
  7.3.2. Ripple Counters
  7.3.3. M- Modulus Counters
  7.3.4. Decade Counters
  7.3.5. Ring Counters

7.3.6. Applications of Counters

Unit 8. Digital Displays **[2 Hrs.]**

8.1. LED Display
8.2. 7-Segments Display

Practical: **[30 Hrs.]**

1. Verify the truth tables of basic gates and other gates: AND, OR, NOT, NAND, NOR, XOR and XNOR Gates
2. Realize and verify truth tables applying DeMorgan's Theorems
3. Verify the universal properties of the NAND gate and NOR gate.
4. Realize and verify truth tables of binary half adder/Subtractor and full adder/Subtractor
5. Implement decimal to 3-4-bit binary encoder
6. Realizing the function of 4-bit binary decoder
7. Realizing the function of 4-to-1 multiplexer and 1-to- 4 demultiplexer circuits.
8. Realizing the function of flip-flops, RS, D, JK, T flip-flops
9. Realizing the function shift-registers: SISO, SIPO, PISO and PIPO
10. Realizing the function ripple counters
11. Realizing the function synchronous counters
12. Realizing and designing of seven-segment display-decoder logic circuit

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction to Digital Signal	3	5
2	Number Systems and Codes	4	7
3	Arithmetic Logic Operations	5	9
4	Logic Gates and Boolean Function	10	18
5	Logic Simplification	5	9
6	Combinational Logic Circuits	8	14
7	Sequential Logic Circuits	8	14
8	Digital Displays	2	4
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. M. Morris Mano, "Digital Logic Circuits and Computer Design", Prentice Hall Publication, 4th edition, 2013.
2. T. Flyod, "Digital Fundamentals", Pearson Publication, 11th edition, 2014.
3. Albert Paul Malvino (2006)," Principle of Digital Electronics", The Mc Graw Hill Companies
4. Ananda Kumar, "Fundamental of Digital Circuits", Prentice Hall –India, 2nd edition, 2013.

Discrete Structure

EG2104CT

Year: II **Total: 4 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: … hours/week

Course description:

This course is designed to cover fundamental concepts of discrete structure like logic, proofs, sets, relations, functions, counting, and probability, with an emphasis on applications in computer science with an emphasis on applications in computer science.

Course objectives:

After completion of this course students will be able to:

1. Demonstrate critical thinking, analytical reasoning, and problem-solving skills
2. Implement the concepts of Counting, Probability, Relations and Graphs respectively.
3. Construct graphs and charts, interpret them, and draw appropriate conclusions

Course Contents:

Theory

Unit 1. Introduction to Set, Relations and Functions [8 Hrs.]

1.1. Introduction to Set Theory:
  1.1.1. Concept of Sets, Subsets and Power Set
  1.1.2. Set Operations: Union, Intersection, Difference, Cartesian Product, Venn Diagram, Computer Representation of Sets
  1.1.3. Fuzzy Sets and membership functions

1.2. Functions: Basic Concept, Injective and Bijective Functions, Inverse and Composite

1.3. Functions, Graph of Functions, Functions for Computer Science (Ceiling Function, Floor Function, Boolean Function, Exponential Function)

1.4. Relations: Relations and their Properties, N-ary Relations with Applications, Representing Relations, Reflexive, symmetric and transitive relations, Equivalence Relations, Partial Ordering

Unit 2. Logical Reasoning and Proof Techniques [10 Hrs.]

2.1. Logic: Propositional logic, logical connectives, laws of equivalences, Predicate and Quantifiers, Rules of Inference in Propositional and Predicate logic

2.2. Proof Methods: Basic Terminology, Direct and Indirect proof (contraposition, contradiction), Proof by mathematical induction

Unit 3. Automata Theory [8 Hrs.]

3.1. Finite State Automata:
  3.1.1. DFA (Deterministic Finite Automata): Formal Definition, Representation, Design
  3.1.2. NFA (Non-Deterministic Finite Automata): Formal Definition, Representation, Design, NFA to DFA conversion
  3.1.3. Regular Expression: Formal Definition, Design

3.2. Grammar Concept:
  3.2.1. Chomsky hierarchy

3.2.2. Context free grammar: Derivation, Parse TREE, Language computation and Grammar design
3.2.3. Regular grammar to finite Automata and vice versa

Unit 4. Recurrence Relation [7 Hrs.]

4.1. Counting Theory: Sum and Product Rule, Pigeonhole Principle, Permutation and Combination, Binomial Expansion
4.2. Recurrence Relation: Linear Recurrence Relations, Solving linear homogeneous recurrence relation with constant coefficients (upto order two)

Unit 5. Graph Theory [12 Hrs.]

5.1. Graphs: Graph definition and types, Representation (Adjacency list, Adjacency and Incidence Matrix), Degree of Vertex, Handshaking Theorem, Cycle, wheel, Regular graph, Bi-Partite Graph
5.2. Connectivity in Graphs: Paths and circuits, complete graph, Weakly and Strongly connected graph, Euler and Hamilton Graph
5.3. Planar graph and Planar representation of graph, Graph Coloring
5.4. Graph Traversal (BFS and DFS)
5.5. Trees: Introduction and Applications, M-ary tree, Binary Tree and properties, Depth of Tree, Applications, Tree Traversals (Pre-order, Post-order and In-order Traversal)

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction to Set, Relation and Function	8	14
2	Logical Reasoning and Proof Techniques	10	18
3	Automata Theory	8	14
4	Recurrence Relations	7	12
5	Graph Theory	12	22
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Kenneth H. Rosen. Discrete Mathematics and Its Applications, 7th Edition, McGraw Hill, 2012.
2. R. Johnsonbaugh, “Discrete Mathematics”, Prentice Hall Inc.
3. Joe L. Mott, Abrahan Kandel, and Theodore P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, Prentice-Hall of India

Software Engineering

EG2105CT

Year: II **Total: 5 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course Description:

This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. One will study the tools and techniques used in analysis and design of software systems, and apply those tools within a recognized software.

Course Objectives:

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

1. Introduce the theory and foundations of software engineering
2. Explain Software Project Management
3. Describe some key aspects of a software engineering process
4. Apply fact-finding and problem-solving skills
5. Determine the requirements for a software system
6. Enlist/Explain key aspects of models and processes for design of a software system
7. Apply current trends in the area of software engineering

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**

1.1. Introduction to software
1.2. Program Vs software
1.3. Software components
1.4. Characteristics of software
1.5. Types of software
1.6. Generic view of software engineering

Unit 2. Software Development Life Cycle Models **[7 Hrs.]**

2.1. Build and fix model
2.2. The waterfall model
2.3. Prototyping model
2.4. Iterative enhancement model
2.5. Spiral model
2.6. Rapid application development model (RAD)
2.7. Selection criteria of a lifecycle model

Unit 3. Software Project Management **[7 Hrs.]**

3.1. Activities in project management
3.2. Software project planning
3.3. Software project management plan
3.4. Software project scheduling and Time Line Charts
3.5. Software project team management and organization
3.6. Software Project estimation

3.6.1. LOC Based Estimation
3.6.2. FP Based Estimation
3.6.3. COCOMO model
3.7. Risk analysis and management
3.8. Risk management process
3.9. Software configuration management

Unit 4. Software Requirement Analysis & Specification [6 Hrs.]
4.1. Requirement engineering
4.2. Requirement elicitation
4.2.1. Interviews
4.2.2. Brainstorming series
4.2.3. Use case approach
4.3. Requirement analysis
4.3.1. Data flow diagram
4.3.2. Data dictionary
4.3.3. Entity-Relationship diagram
4.4. Requirement documentation
4.4.1. Nature of SRS
4.4.2. Characteristics of a good SRS
4.4.3. Organization of SRS

Unit 5. Software Design [6 Hrs.]
5.1. Objectives of design
5.2. Design framework
5.3. Software design models
5.4. Design process
5.5. Architecture design
5.6. Low level design
5.7. Software design strategies
5.8. Function oriented design Vs Object oriented design

Unit 6. Software Metrics [3 Hrs.]
6.1. Software metrics
6.2. Token count
6.3. Data structure metrics
6.4. Information flow metrics
6.5. Metrics analysis

Unit 7. Software Reliability [2 Hrs.]
7.1. Basic Concepts
7.2. Software quality
7.3. Software reliability model

Unit 8. Quality Management and Testing [7 Hrs.]
8.1. Software quality attributes
8.2. Quality factors
8.3. Quality control
8.4. Quality assurance
8.5. Verification and validation

8.6. Testing and debugging
8.7. Testing process
8.8. Unit testing
8.9. Integration testing
8.10. System testing
8.11. Regression testing
8.12. White Box testing and Black Box testing

Unit 9. Software Maintenance [3 Hrs.]

9.1. Need for software maintenance
9.2. Types of software maintenance
9.3. Software maintenance process model
9.4. Software maintenance cost

Practical: [30 Hrs.]

The practical should contain all features mentioned above.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Software Development Life Cycle Models	7	12
3	Software Project management	7	12
4	Software Requirement Analysis & Specification	6	11
5	Software Design	6	11
6	Software Metrics	3	5
7	Software Reliability	2	5
8	Quality Management and Testing	7	12
9	Software Maintenance	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

Reference:

1. Agarwal, K. and Singh, Y., 2007. *Software Engineering*. (3rd ed). New Delhi: New Age International Publisher.
2. Ghezzi, Jayazeri and Mandrioli(2002). *Fundamentals of Software engineering* (2nd ed).
3. Mall, Rajib(2006).*Fundamentals of Software Engineering* (2nd ed). India: Prentice-Hall of India
4. Sommerville, I. (2010). *Software engineering* (10th ed). Harlow, England: Addison-Wesley.

Basic Electrical and Electronics Engineering

EG2106CT

Year: II **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: 3 hours/week

Course description:

This course is designed to understand fundamental concept of electric and electronic circuits.

Course objectives:

After completion of this course students will be able to:

1. Differentiate between active and passive elements and circuits.
2. Identify and explain the working principle of electric circuits.
3. Identify and explain the working principle of electronic circuits.

Course Contents:

Theory

Unit 1. Basic Electric System [6 Hrs.]

1.1. Constituent parts of an electric system (Source, Load, Communication and Control)
1.2. Current flow in a circuit
1.3. Electromotive Force and Potential Difference
1.4. Electrical Units
1.5. Passive Components: Resistance, Inductance & Capacitance, Series and Parallel Combinations
1.6. Voltage and Current Sources: Independent, Dependent, VCVS, VCCS, CCCS, CCVS
1.7. Ohm's Law
1.8. Temperature rise and Temperature Coefficient of Resistance

Unit 2. DC Circuits and Network Theorems [6 Hrs.]

2.1. Power and Energy
2.2. Kirchhoff's Law and Its Application: Nodal Analysis and Mesh Analysis
2.3. Star – Delta and Delta – Star Transformation
2.4. Superposition Theorem
2.5. Thevenin's Theorem
2.6. Norton's Theorem
2.7. Maximum Power Transfer Theorem
2.8. Reciprocity Theorem

Unit 3. Alternating Quantities [4 Hrs.]

3.1. AC system
3.2. Waveform, Terms and Definitions
3.3. Average and rms values of Current and Voltage
3.4. Phasor Representation

Unit 4. Single – Phase AC Circuits [4 Hrs.]

4.1. AC in Resistive Circuits
4.2. Current and Voltage in an Inductive circuit

4.3. Current and Voltage in an Capacitive circuit
4.4. Concept of Complex Impedance and Admittance
4.5. AC Series and Parallel Circuits
4.6. RL, RC and RLC Circuit Analysis and Phasor Representation

Unit 5. Power in AC Circuits [5 Hrs.]

5.1. Power in Resistive Circuits
5.2. Power in Inductive and Capacitive Circuits
5.3. Power in Circuits with Resistance and Reactance
5.4. Active and Reactive Power: Power Factor, Importance and Measurement of Power Factor

Unit 6. Diode [6 Hrs.]

6.1. Conductor, Insulator and Semiconductor
6.2. Types of Semiconductors: Intrinsic and Extrinsic, P type and N type
6.3. Semiconductor Diode Characteristics
6.4. Diode Circuits: Clipper and Clamper Circuits
6.5. Zener Diode, LED, Photodiode, Varacter Diode, Tunnel Diode
6.6. DC Power Supply: Rectifier (Half – Wave and Full - Wave), Zener Regulated Power Supply

Unit 7. Transistor [6 Hrs.]

7.1. BJT: Types, Configurations, Modes of Operations, Working Principle
7.2. Biasing of BJT
7.3. BJT as an Amplifier and a Switch
7.4. Small and Large Signal Models
7.5. BJT as Logic Gates
7.6. Concept of Differential Amplifier using BJT

Unit 8. MOSFET [4 Hrs.]

8.1. Types and Construction of MOSFET
8.2. Working Principle of MOSFET
8.3. Biasing of MOSFET
8.4. Construction and working of CMOS
8.5. MOSFET and CMOS as Logic Gates

Unit 9. The Operational Amplifier (Op - Amp) [4 Hrs.]

9.1. Basic Model, Ideal and Real Characteristics, Virtual Ground Concept
9.2. Inverting and Non – Inverting Mode Amplifier
9.3. Some Applications: Summing Amplifier, Differentiator, Integrator, Comparator

Practical: [45 Hrs.]

1. Measurement of Voltage, Current and Power in DC Circuits
   a) Verification of Ohm's Law
   b) Temperature Effect in Resistance
2. Kirchhoff's Current and Voltage Law
   a) Evaluate Power from V and I
   b) Note Loading Effects in Meters
3. Measurement of Amplitude, Frequency and Time in Oscilloscope
   a) Calculate and Verify Average and rms Values

b) Examine Phase Relation in RL and RC Circuits

4. Measurement of Alternating Quantities
   a) R, RL, RC Circuits with AV Excitation
   b) AC Power, Power Factor, Phasor Diagram
5. Diode Characteristics, Rectifiers and Zener Diode
6. BJT Characteristics
7. MOSFET Characteristics
8. Voltage Amplifier using OP – Amp, Comparators

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Basic Electric System	6	10
2	DC Circuits and Network Theorems	6	10
3	Alternating Quantities	4	8
4	Single – Phase AC Circuits	4	8
5	Power in AC Circuits	5	8
6	Diode	6	10
7	Transistor	6	10
8	MOSFET	4	8
9	The Operational Amplifier (Op - Amp)	4	8
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. B. L. Theraja and A. K. Theraja, “A Textbook on Electrical Technology”, S Chand, Latest Edition
2. J. R. Cogdell, “Foundations of Electrical Engineering”, Prentice Hall, Latest Edition
3. J. B. Gupta, “A Textbook on Electrical Technology”, Katson, Latest Edition
4. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, Latest Edition
5. Thomas L. Floyd, “Electronic Devices”, Pearson Education, Latest Edition

Second Year/ Second Part

S.N.	Course Code	Subject
1	EG2201CT	Database Management System
2	EG2202CT	Data Structure and Algorithm
3	EG2203CT	Object Oriented Programming in Java
4	EG2204CT	Microprocessor and Computer Architecture
5	EG2205CT	Web Technology II
6	EG2206CT	Statistics and Probability

Database Management System

EG2201CT

Year: II **Total: 6 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course covers the core principles and techniques required in the design and implementation of database systems. It consists of relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present, Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery.

Course objectives:

The main objectives of this course are:

1. Explain the concepts of database and database management system.
2. Provide knowledge of database design using entity relationship diagram.
3. Perform on SQL statements, normalization, transaction processing, and database recovery.

Course Contents:

Theory

Unit 1. Introduction **[5 Hrs.]**

1.1. History, Database and its applications
1.2. Characteristics
1.3. Architecture
1.4. Data abstraction and Independence
1.5. Schemas and Instances
1.6. Classifications of DBMS
1.7. Introduction to DDL, DML, DCL

Unit 2. Data Models **[8 Hrs.]**

2.1. Introduction to Entity Relationship Model
2.2. Entities type
2.3. Entities set
2.4. Attributes and keys
2.5. Relationship types and sets
2.6. E-R diagrams

Unit 3. Normalization **[6 Hrs.]**

3.1. Importance of Normalization
3.2. Functional Dependencies
3.3. Integrity and Domain constraints
3.4. Normal forms (1NF, 2NF, 3NF, BCNF)

Unit 4. Relational Language **[8 Hrs.]**

4.1. Introduction to SQL
4.2. Features of SQL

4.3. Basic Retrieval queries
4.4. INSERT, UPDATE, DELETE queries
4.5. Join, Semi join and Sub queries
4.6. Views
4.7. Relational Algebra
    4.7.1. Select, Project
    4.7.2. Set Operations
    4.7.3. Cartesian Product
    4.7.4. Join

Unit 5. Query Processing **[6 Hrs.]**

5.1. Introduction to Query Processing
5.2. Query Cost estimation
5.3. Query Operations, Operator TREE
5.4. Evaluation of Expressions
5.5. Query Optimization
5.6. Performance Tuning

Unit 6. Transaction and Concurrency Control **[6 Hrs.]**

6.1. Introduction to Transaction
6.2. Serializability concept
6.3. Concurrent execution
6.4. Lock based Concurrency Control
6.5. 2PL and Strict 2PL
6.6. Timestamp concept

Unit 7. Recovery **[6 Hrs.]**

7.1. Failure Classifications
7.2. Recovery and Atomicity
7.3. IN PLACE and Out of Place Update
7.4. Log based Recovery
7.5. Shadow Paging
7.6. Local Recovery Manager
7.7. UNDO and REDO protocol

Practical: **[30 Hrs.]**

1. SQL Queries on CREATE, INSERT, DELETE, and UPDATE operations.
2. SQL query for SELECT operation.
3. SQL query for ALTER operations.
4. SQL queries on JOIN
5. SQL query using aggregate functions.
6. Apply SQL for specifying constraints.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	5	8
2	Data Model	8	14
3	Normalization	6	11
4	Relational Language	8	14
5	Query Processing	6	11

6	Transaction and Concurrency Control	6	11
7	Recovery	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Silberschatz, H.F. Korth, and S. Sudarshan (2010), Database System Concepts, 6th Edition, McGraw Hill
2. Ramez Elmasri and Shamkant B. Navathe (2010), Fundamentals of Database Systems, 6 th Edition, Pearson Addison Wesley
3. Raghu Ramakrishnan, and Johannes Gehrke (2007), Database Management Systems, 3rd Edition, McGraw-Hill
4. Jaffrey D. Ullman, Jennifer Widom; A First Course in Database Systems; Third Edition; Pearson Education Limited

Data Structure and Algorithm

EG2202CT

Year: II **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course Description:

The purpose of this course is to provide the students with the basic concepts of data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that might occur. This course offers the students a mixture of theoretical knowledge and practical experience.

Course Objectives:

On completion of this course the students will be enabled to:

1. Introduce data abstraction and data representation in memory.
2. Discuss, design and use elementary data structures such as stack, queue, linked list, tree and graph.
3. Decompose complex programming problems into manageable sub-problems.
4. Introduce theory of algorithms and their complexity.

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

1.1. Algorithm and its types
1.2. Data structure and its types
1.3. Tools for algorithm analysis (Big O Notation)
  1.3.1. Type of analysis: Time and space complexity
  1.3.2. Asymptotic Notations: Big- O, Big-Ω and Big-θ

Unit 2. Stack and Queue **[6 Hrs.]**

2.1. Stack and Operation
  2.1.1. Continuous implementation of Stack with varying and fixed TOS
2.2. Application of Stack
  2.2.1. Converting Infix to Post fix expression
  2.2.2. Evaluating Post Fix expression
2.3. Queue and Operation
  2.3.1. Definition
  2.3.2. Algorithm of Enqueue and dequeue
  2.3.3. Linear Queue
  2.3.4. Circular Queue
  2.3.5. Priority Queue
  2.3.6. Applications of Queue

Unit 3. List **[8 Hrs.]**

3.1. Definition and Structure of link list
3.2. Advantage and disadvantages of link list

3.3. Operations in Singly Linked list
  3.3.1. Insertion at the beginning and end, after the node, before the node
  3.3.2. Deletion at the beginning and end, after the node, before the node
3.4. Doubly linked list
  3.4.1. Definition
  3.4.2. Structure of doubly linked list
  3.4.3. Insertion at the beginning and end, after the node, before the node
  3.4.4. Deletion at the beginning and end, after the node, before the node
  3.4.5. Advantages and disadvantages

Unit 4. Recursion **[3 Hrs.]**

4.1. Properties of recursion
4.2. Recursion vs Iteration
4.3. TOH and its solution
4.4. Solution of Fibonacci sequence and factorial

Unit 5. Trees **[6 Hrs.]**

5.1. Tree concepts
5.2. Binary tree
5.3. Application of binary tree
5.4. Node representation
5.5. Operation in Binary Tree
  5.5.1. Insertion
  5.5.2. Deletion
5.6. Algorithm of tree search
5.7. Tree traversals
  5.7.1. Pre order
  5.7.2. In order
  5.7.3. Post order
5.8. Height, level and depth of tree and its importance
5.9. AVL balance tree
  5.9.1. Definition
  5.9.2. Detection of unbalance
  5.9.3. Single and double rotation in balancing

Unit 6. Sorting **[6 Hrs.]**

6.1. Definition
6.2. Types of sorting (Internal and external)
6.3. Algorithm of Bubble sort
6.4. Algorithm of Insertion sort
6.5. Algorithm of Selection sort
6.6. Algorithm for Quick sort
6.7. Algorithm for Merge sort
6.8. Algorithm for Heap sort

Unit 7. Search **[7 Hrs.]**

7.1. Sequential search
7.2. Binary search
7.3. Tree search algorithm
7.4. Hashing

7.4.1. Definition
7.4.2. Hash function and Hash table
7.4.3. Collision in Hashing
7.4.4. Collision Resolution Techniques (Open and Closed)

Unit 8. Graph **[7 Hrs.]**

8.1. Components of Graph
8.2. Directed and Undirected
8.3. Connected and Unconnected
8.4. Path and Cycle
8.5. Adjacency sets and tables
8.6. Array based representation
8.7. Linked based and mixed implementation
8.8. Minimum Spanning Trees:
8.8.1. Kruskal's Algorithms and prim's algorithm
8.8.2. Algorithm of graph traversal (Depth First traversal, Breadth First traversal)
8.8.3. Shortest path algorithm

Practical: **[45 Hrs.]**

1. Implement stack using array
2. Implement linear and circular queue
3. Solve TOH & Fibonacci sequence using recursion
4. Implement linked list: singly and doubly
5. Perform basic operations on a binary tree data structure.
6. Implement binary search using function and without function.
7. Implement Hashing for handling the collision.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1.	Introduction	2	4
2.	Stack and Queue	6	11
3.	List	8	14
4.	Recursion	3	5
5.	Trees	6	11
6.	Sorting	6	11
7.	Search	7	12
8.	Graph	7	12
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Agarwal, U. (2012). Data Structure Using C. (3rd ed.). : S K Katari & Sons.
2. Tenenbaum, A.M, Langsam, Y & Augustein, M.J. (1996). Data Structure Using C and C++. (2nd ed.). India: Prentice Hall India.
3. Sahni, S. (2002). Data Structures, Algorithms and Applications in C++. (2nd ed.). India: University Press

Object-Oriented Programming in Java

EG2203CT

Year: II **Total: 8 hours /week**

Part: II **Lecture: 4 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

The purpose of this course is to introduce the concepts Object Oriented Programming using Java programming including introduction, basic structure, classes and objects, inheritance, interfaces, packages, exception handling, and multithreading. At the end, students will be able to write computer programs using different features of Java Programming.

Course objectives:

After completion of this course students will be able to:

1. Implement the concept of Object-Oriented Programming.
2. Implement object, class, inheritance, polymorphism, encapsulation and data abstraction in programming.
3. Implement the problems in Java using Object-Oriented approach.

Course Contents:

Theory

Unit 1. Object-Oriented Programming [3 Hrs.]

1.1. Procedure Oriented Programming
1.2. Object-Oriented Programming
1.3. Procedure Oriented versus Object Oriented Programming
1.4. OOP principles
1.5. Advantages and Disadvantages of OOP

Unit 2. Introduction to Java [2 Hrs.]

2.1. Java as a Programming Platform
2.2. History of Java
2.3. Java Buzzwords
2.4. Java Virtual Machine

Unit 3. Fundamental Programming Structures [10 Hrs.]

3.1. Whitespace, Identifiers, Literals, Comments, Separators and Keywords
3.2. Data Types and Conversion
3.3. Variables
3.4. Constants
3.5. Operators
3.6. Strings
3.7. Control Structures
3.8. Loop
3.9. Methods
3.10. Arrays

Unit 4. Classes and Objects [10 Hrs.]

4.1. Defining Class
4.2. Adding Variables
4.3. Adding Methods

4.4. Static Variables, Methods, Blocks and Class
4.5. Access Control
4.6. Method Parameters
4.7. Creating Objects
4.8. Accessing class members
4.9. Setters and Getters
4.10. Constructors
4.11. Overloading Methods
4.12. Call by value, Call by reference
4.13. this keyword
4.14. final modifier
4.15. Nested Classes
4.16. Wrapper Classes in Java
4.17. Garbage Collection

Unit 5. Inheritance [8 Hrs.]

5.1. Introduction
5.2. Types of Inheritance
5.3. Method Overriding
5.4. Using Super keyword
5.5. Execution of Constructors in Multilevel Inheritance
5.6. Abstract Classes and Methods

Unit 6. Interface and package [8 Hrs.]

6.1. Defining Interfaces
6.2. Extending Interfaces
6.3. Implementing Interfaces
6.4. Accessing Interface Variables
6.5. Introduction to java Packages
6.6. Creating a Package and naming convention
6.7. Using Packages

Unit 7. Exception Handling [6 Hrs.]

7.1. Exceptions and its types
7.2. Exception handling fundamentals (try, catch, throw, throws and finally)
7.3. Using try and catch
7.4. Using throw and throws

Unit 8. Multithreading [6 Hrs.]

8.1. Introduction of Thread
8.2. Creating a Thread
8.3. Thread Priorities
8.4. Life cycle of a Thread (Thread states)

Unit 9. I/O [7 Hrs.]

9.1. Java.io package
9.2. Byte Stream and Character Stream classes
9.3. Using FileInputStream and FileOutputStream classes
9.4. Using FileReader and FileWriter Classes

Practical: **[45 Hrs.]**

1. Install Java Tools.
2. Create and demonstrate programs using control statements and array.
3. Create and demonstrate programs using class, object, methods and constructor.
4. Create and demonstrate programs using inheritance.
5. Create and demonstrate programs using method overloading and method overriding.
6. Create and import Java Packages and Sub-Packages.
7. Create and demonstrate programs using interface.
8. Create and demonstrate programs for exception handling.
9. Create and demonstrate programs for concept of multithreading.
10. Create and demonstrate I/O programs.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Object-Oriented Programming	3	4
2	Introduction to Java	2	3
3	Fundamental Programming Structures	10	13
4	Classes and Objects	10	13
5	Inheritance	8	11
6	Interface and package	8	11
7	Exception Handling	6	8
8	Multithreading	6	8
9	I/O and Java Applets	7	9
	Total	**60**	**80**

* There may be minor deviation in marks distribution.

References:

1. Balaguruswamy, E. (2014). *Programming with JAVA - A Primer: Third Edition.* McGraw-Hill Professionals.
2. David Holmes, K. A. (2005). *THE Java™ Programming Language, Fourth Edition.* Addison-Wesley Professional.
3. Horstmann, C. S. (2018). *Core Java Volume I--Fundamentals.* Pearson.
4. M. T. SOMASHEKARA, D. S. (2017). *OBJECT ORIENTED PROGRAMMING WITH JAVA.* PHI Learning Pvt. Ltd.
5. Mohan, P. (2013). *Fundamentals of Object-Oriented Programming in Java.* CreateSpace Independent Publishing Platform.

Microprocessor and Computer Architecture

EG2204CT

Year: II **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: 3 hours/week

Course description:

This course is designed to explore architecture of a microprocessor and its programming in assembly language. The student will be able to apply logics to various given problems and develop programs using assembly language construct that would help them to develop real time microprocessor-based application programs. This course also includes the concept of instruction set architecture, organization or micro architecture and concepts of computer arithmetic.

Course objectives:

After completion of this course students will be able to:

1. Discuss the architecture of 8085 microprocessor and assembly language programming.
2. Demonstrate the basic structure and operation of digital computer.
3. Explain microprogrammed control unit.
4. Explore the concept of pipelining.
5. Discuss data and algorithm used to perform operations on data.

Course Contents:

Theory

Unit 1. Introduction of Microprocessor [8 Hrs.]

1.1. Evolution of microprocessor and it's types
1.2. Microprocessor Bus organization: Data Bus, Address Bus and Control Bus
1.3. Operations of microprocessor: internal data manipulation, microprocessor initiated and peripheral or external initiated
1.4. Pin diagram and internal Architecture of 8085
1.5. Internal registers organization of 8085
1.6. Limitations of 8085

Unit 2. Instruction Cycle and Timing Diagram [3 Hrs.]

2.1. 8085 machine cycles
2.2. Bus timings to fetch, decode, execute instruction from memory
2.3. Memory read and write
2.4. Input/output read and write cycle with timing diagram

Unit 3. 8085 Instruction set [12 Hrs.]

3.1. Machine language instruction format:
  3.1.1. Single byte
  3.1.2. Two bytes
  3.1.3. Three-byte instructions
3.2. Various addressing modes
3.3. Data transfer operation and instruction
3.4. Arithmetic operation and instruction
3.5. Logical operation and instruction

3.6. Branch operation and instruction
3.7. Stack operation and instruction
3.8. Input/output and machine control operation and instruction
3.9. Simple programs with 8085 instructions

Unit 4. Basic Computer Architecture [4 Hrs.]

4.1. Introduction
  4.1.1. History of Computer Architecture
  4.1.2. Overview of Computer Organization
  4.1.3. Memory Hierarchy and cache
4.2. Instruction Codes
4.3. Stored Program Organization
4.4. Indirect address, computer registers
4.5. Common Bus system
4.6. Instruction sets
4.7. Instruction types

Unit 5. Design of Microprogrammed Control Unit [10 Hrs.]

5.1. Control Word, Microprogram, Control Memory
5.2. Control Address Register, Sequencer
5.3. Address Sequencing
5.4. Conditional Branch
5.5. Mapping of Instructions
5.6. Subroutines, Microinstruction Format, Symbolic Microinstructions
5.7. Central Processing Unit
  5.7.1. Introduction
  5.7.2. General Register Organization
  5.7.3. Stack Organization
5.8. Instruction Formats
5.9. Addressing Modes
5.10. RISC vs CISC
5.11. Pipeline and Vector Processing
  5.11.1. Arithmetic and Instruction pipeline
  5.11.2. Vector operations
  5.11.3. Matrix Multiplication, memory interleaving

Unit 6. Computer Arithmetic [3 Hrs.]

6.1. Data Representation
  6.1.1. Fixed point Representation
  6.1.2. Floating point Representation
6.2. Addition and Subtraction with Signed Magnitude Data
6.3. Addition and Subtraction with Signed 2's Complement Data
6.4. Multiplication of Signed Magnitude Data
6.5. Booth Multiplication

Unit 7. Input Output Organization [5 Hrs.]

7.1. Input-Output Interface
  7.1.1. I/O Bus and Interface Modules
  7.1.2. I/O vs. Memory Bus
  7.1.3. Isolated vs. Memory-Mapped I/O

7.2. Asynchronous Data Transfer: Strobe, Handshaking
7.3. Modes of Transfer:
  7.3.1. Programmed I/O
  7.3.2. Interrupt-Initiated I/O
  7.3.3. Direct memory Access
7.4. Direct Memory Access, Input-Output Processor, DMA vs. IOP

Practical: **[45 Hrs.]**

1. Demonstrate 8085 using kit/simulator
2. Implement program to perform arithmetic operations (Add, subtract, multiply and divide) on signed and unsigned two 8-bit numbers.
3. Implement a program to mask the lower four bits of content of the memory location.
4. Implement a program to set higher four bits of content of the memory location to 1.
5. Implement a program to perform Exclusive OR of two numbers.
6. Implement a program to exchange the content of two memory locations.
7. Implement program to add/subtract 16-bit numbers
8. Implement program to copy content of one memory location to another memory location.
9. Implement a program to check whether given no is odd or even.
10. Implement a program to count no of zero value in given block of data.
11. Implement algorithms for computer arithmetic using high level language like C or C++

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction of Microprocessor	8	14
2	Instruction Cycle and Timing Diagram	3	5
3	8085 Instruction set	12	22
4	Basic Computer Architecture	4	7
5	Design of Microprogrammed Control Unit	10	18
6	Computer Arithmetic	3	5
7	Input Output Organization	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Stallings W, Computer Organization and Architecture, 4th Edition, Prentice Hallof India Private Limited.
2. Malvino A.P., Brown J.A., Digital Computer Electronics, 3rd Edition, Tata McGraw Hill Hall
3. D.V, Microprocessors and Interfacing– Programming and Hardware, McGraw Hill
4. Gaonkar R, Microprocessor Architecture, Programming, and application with 8085, Penram International Publication

Web Technology II

EG2205CT

Year: II **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

The purpose of this course is to introduce the concepts of Web Technology using PHP programming including introduction, basic structure, classes and objects, inheritance and exception handling. This course also helps to implement database connectivity and manipulation, XML, AJAX and PHP framework. At the end, students will be able to design and develop dynamic web contents and applications.

Course objectives:

After completion of this course students will be able to:

1. Implement PHP for the basic of server-side scripting language
2. Apply PHP and MySQL for the fundamentals of database, database design and their uses in web programming
3. Use XML, AJAX and Content Management Systems

Course Contents:

Theory

Unit 1. Web Server Concept **[5 Hrs.]**

1.1. Introduction to Web Server
1.2. Architecture of web server
1.3. Concept of Dynamic Content
1.4. Using control flow to control dynamic content generation
1.5. Concept of Architecting Web Application

Unit 2. Review of Database: MySQL **[4 Hrs.]**

2.1. Introduction to MySQL
2.2. MySQL queries
  2.2.1. Create
  2.2.2. Insert
  2.2.3. Select
  2.2.4. Update
  2.2.5. Delete
  2.2.6. Alter
2.3. Database Normalization

Unit 3. Server-Side Script: PHP **[12 Hrs.]**

3.1. Introduction of PHP
3.2. Advantage of using PHP for web development
3.3. PHP Installation
3.4. PHP Syntax
3.5. Comments, Variable, Operators, Datatype, Strings, Keywords
3.6. Conditional Statements
3.7. Loop
3.8. Arrays

3.9. Functions
3.10. Passing variables with data between pages
  3.10.1. Get & Post Method
  3.10.2. Cookies
  3.10.3. Sessions
3.11. File Upload: Date, Include, File, File Upload
3.12. Accessing Form Elements, Form Validation
3.13. Exception and Error Handling

Unit 4. Object oriented concept and Database Connectivity [8 Hrs.]

4.1. Classes and Objects
4.2. Access Modifiers
4.3. Constructors and Destructors
4.4. Inheritance and Scope
4.5. Overwriting Methods
4.6. Database Connectivity
  4.6.1. Creating database with Server-Side Script
  4.6.2. Connecting Server-Side Script to Database
  4.6.3. Multiple Connections
  4.6.4. Making queries
  4.6.5. Building in Error Checking
  4.6.6. Fetching Data sets
  4.6.7. Displaying Queries in tables
  4.6.8. Building Forms and control form data using queries

Unit 5. AJAX and eXtensible Markup Language (XML) [8 Hrs.]

5.1. Basic concept of AJAX
5.2. Features of XML
5.3. Structure of XML: Logical Structure, Physical Structure
5.4. Naming Rules
5.5. XML Elements
5.6. XML Attributes
5.7. Element Content Models: Element Sequences i.e., <!ELEMENT counting (first, second, third, fourth)>, Element Choices <!ELEMENT choose (this.one | that.one)>, Combined Sequences and Choices
5.8. Element Occurrence Indicators: -Discussion of Three Occurrence Indicators? (Question Mark) * (Asterisk Sign) + (Plus Sign)
5.9. XML schema languages: Document Type Definition (DTD), XML Schema Definition (XSD)
5.10. XML Style Sheets (XSLT)

Unit 6. PHP Framework [8 Hrs.]

6.1. Introduction
6.2. Features
6.3. Basic DB & Client-Side Validation
6.4. Session & Email System
6.5. Framework with method, Classes and Cookies

Practical: **[45 Hrs.]**

1. Installing required software and platforms for local servers and scripting (IDE, XAMPP, WAMPP, LAMPP etc.)
2. Simple programs using;
   2.1 Control and loops
   2.2 Strings
   2.3 Arrays
   2.4 Functions
3. Passing Information between pages
4. Forms handling, validation etc.
5. Writing to file, reading from file and file upload
6. Examples of sessions and cookies
7. Connecting to database
8. Using various queries on database to extract, insert, update and delete from the web interface
9. Using XML markup elements and its attributes
10. Concept of using simple AJAX in webpage
11. Design and develop a dynamic web page which should include database

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Web Server Concept	5	10
2	Review of database: MySQL	4	8
3	Server-Side Script: PHP	12	20
4	Object oriented concept and Database Connectivity	8	14
5	AJAX and eXtensible Markup Language (XML)	8	14
6	PHP Web Design Framework	8	14
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Bayross "*Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, PHPI*" BPB Publication
2. Hornberger Allen, "*Mastering in PHP*", BPB Publication
3. Converse and Park with Morgan "*PHP MYSQL Bible*" WILEY Publication
4. Sybex "*ASP, ADO and XML Complete*" BPB Publication
5. Russell "*Mastering Active Server Pages* "(BPB)

Statistics and Probability

EG2206CT

Year: II **Total: 4 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: hours/week

Course description:

This course deals with a practical knowledge of the principles and concept of probability and statistics and their application to simple engineering problems.

Course objectives:

After completion of this course students will be able to:

1. Explain the principles and concept of probability.
2. Apply statistics to solve simple engineering problems.

Course Contents:

Theory

Unit 1. Introduction of Statistics [3 Hrs.]

1.1. Origin and development of statistics
1.2. Definition of statistics
1.3. Importance and scope of statistics
1.4. Limitation of statistics

Unit 2. Collection of data. [3 Hrs.]

2.1. Data, types of data
2.2. Methods of collecting primary data
2.3. Sources of secondary data

Unit 3. Classification and Tabulation [3 Hrs.]

3.1. Classification of data
3.2. Meaning and Importance of table
3.3. Parts of table

Unit 4. Diagrammatic and graphic representation [4 Hrs.]

4.1. Difference between diagram and graphs
4.2. Bar diagram and its type
4.3. Histogram and pie diagram
4.4. Graphical representation of data
4.5. Limitation of diagrams and graphs

Unit 5. Summarizing a Data set [8 Hrs.]

5.1. Introduction
5.2. Measures of central tendency (Mean, Medain, Mode, G.M, S.M)
5.3. Partition values (quartiles, deciles, percentiles)
5.4. Measures of description (rage, Q.D., M.D., S.D.)

Unit 6. Bivariate data analysis [8 Hrs.]

6.1. Correlation (karl pearson's coefficient of correlation)
6.2. Lines of regression, equations of regression

Unit 7. Classification and Tabulation **[6 Hrs.]**

7.1. Definition and terminology of probability
7.2. Counting rule (permutation and combination)
7.3. Addition theorem of probability
7.4. Theorem of compound probability or multiplication

Unit 8. Classification and Tabulation **[10 Hrs.]**

8.1. Random variables
8.2. Binomial Distribution
8.3. Poisson distribution
8.4. Normal distribution

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction of Statistics	3	5
2	Collection of data	3	5
3	Classification and Tabulation	3	5
4	Diagrammatic and graphic representation	4	5
5	Summarizing a data set	8	15
6	Bivariate data analysis	8	15
7	Concept of probability	6	10
8	Theoretical probability distribution	10	20
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Dr. Arun Kumar Chaudhary, Aswin 2078, Business statistics, Bhudipuran Prakashan, Bagbazar.
2. S.C. Gupta, 2018, Fundamentals of statistics, Himalaya Publishing House, India
3. H.C. Saxena, 17th edition, Elementary Statistics, S.Chand & CO. Ltd., India

Third Year/ First Part

S.N.	Course Code	Subject
1	EG3101CT	Computer Graphics
2	EG3102CT	Data Communication and Network
3	EG3103CT	Operating System
4	EG3104CT	Computer Repair and Maintenance
5	EG3105CT	Data Mining and data warehousing
6		Elective – I
	EG3106CT.1	a) Geographical Information System
	EG3106CT.2	b) E-commerce
	EG3106CT.3	c) Management Information System
7	EG3107CT	Minor Project

Computer Graphics
EG3101CT

Year: III **Total: 6 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: … hours/week
Lab: 2 hours/week

Course description:
This course deals with graphics hardware, two dimensional and three-dimensional graphics, fundamentals of animation techniques; graphical user interface design, web graphics design and graphics design packages.

Course objectives:
After completion of this course students will be able to:
1. Acquire the knowledge of computer graphics.
2. Familiarize with hardware involved in graphics.
3. Familiarize with the algorithms to generate two-dimensional and three-dimensional graphical objects and animations.

Course Contents:

Theory

Unit 1. Introduction [3 Hrs.]
- 1.1. History of Computer Graphics
- 1.2. Application of Computer Graphics
- 1.3. CAD and CAM

Unit 2. Graphics Hardware [8 Hrs.]
- 2.1. Input Hardware
  - 2.1.1. Keyboard, Mouse (mechanical & optical), Light pen, Touch panel (Optical, Sonic, and Electrical), Digitizers (Electrical, Sonic, Resistive), Scanner, Joystick
- 2.2. Output Hardware
  - 2.2.1. Monitors
  - 2.2.2. Monochromatic CRT Monitors
  - 2.2.3. Color CRT Monitors
  - 2.2.4. Flat Panel Display Monitors
- 2.3. Hardcopy Devices
  - 2.3.1. Plotters
  - 2.3.2. Printers
- 2.4. Raster and Vector Display Architectures, Principles and Characteristics

Unit 3. Two Dimensional Algorithms and Transformations [10 Hrs.]
- 3.1. Mathematical Line Drawing Concept
- 3.2. Line Drawing Algorithms
  - 3.2.1. Digital Differential Analyzer (DDA)
  - 3.2.2. Bresenham's Line Drawing Algorithm
- 3.3. Mid-point Circle Drawing
- 3.4. Mid-point Ellipse Drawing Algorithm
- 3.5. Review of Matrix Operations – Addition and Multiplication
- 3.6. Two-dimensional Transformations
  - 3.6.1. Translation

3.6.2. Scaling
3.6.3. Rotation
3.6.4. Reflection
3.6.5. Shearing
3.7. Two-Dimensional Viewing Pipeline

Unit 4. Three-Dimensional Graphics [16 Hrs.]

4.1. Three-dimensions transformations
4.1.1. Translation
4.1.2. Scaling
4.1.3. Rotation
4.1.4. Reflection
4.1.5. Shearing
4.2. Three-dimensional Viewing Pipeline
4.3. Three-dimensions Projections
4.3.1. Concept of Projection
4.3.2. Projection of 3D Objects onto 2D Display Devices
4.3.3. Three-dimensional Projection Methods
4.3.3.1. Parallel Projection Method
4.3.3.2. Perspective Projection Method
4.4. Three-dimensional Object Representations
4.4.1. Polygon Surfaces
4.4.2. Polygon Tables
4.5. Introduction to Hidden Line and Hidden Surface Removal Techniques
4.5.1. Object Space Method
4.5.2. Image Space Method
4.6. Introduction to Illumination/ Lighting Models
4.6.1. Ambient Model
4.6.2. Diffuse Model
4.6.3. Specular Model
4.7. Introduction to Shading/ Surface Rendering Models
4.7.1. Constant Shading Model
4.7.2. Gouraud Shading Model
4.7.3. Phong Shading Model

Unit 5. Web Graphics Designs and Graphics DesignPackages [5 Hrs.]

5.1. Introduction to graphics file formats
5.2. Principles of web graphics design – browser safe colors, size, resolution, background, anti-aliasing
5.3. Type, purposes and features of graphics packages
5.4. Examples of graphics packages and libraries

Unit 6. Virtual Reality [3 Hrs.]

6.1. Introduction
6.2. Types of Virtual Reality
6.2.1. Non-immersive Virtual Reality
6.2.2. Semi-immersive Virtual Reality
6.2.3. Fully-immersive Virtual Reality
6.2.4. Augmented Virtual Reality
6.2.5. Collaborative Virtual Reality

6.3. Applications of Virtual Reality

Practical: **[30 Hrs.]**

As a part of the laboratory exercise, the students should implement all the algorithms studied in different chapters. At the end, students are required to integrate the codes they have written in earlier practical sessions to create a small project.

The lab contains few sessions dedicated to introduce the students to some of the popular professional graphics packages and CAD packages and explore their features. The course/lab instructor recommends packages to use.

Some algorithm implementation sessions may include:

1. Implementation of Digital Differential Analyzer (DDA), a line Drawing Algorithm.
2. Implementation of Bresenham's Line Drawing Algorithm.
3. Implementation of mid-point Circle Drawing Algorithm.
4. Implementation of mid -point Ellipse Drawing Algorithm.
5. Implementation of basic 2D transformation.
6. Implementation of basic 3D transformation.
7. Implementation of basic projections.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	3	6
2	Graphics Hardware	8	15
3	Two Dimensional Algorithms and Transformations	10	20
4	Three-Dimensional Graphics	16	25
5	Web Graphics Designs and Graphics Design Packages	5	8
6	Virtual Reality	3	6
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. D. Hearn and M. P. Baker, "Computer Graphics", PHI Edition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, "Computer Graphics, Principles, and Practice", PHI Edition

Data Communication and Computer Network

EG3102CT

Year: II **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course is designed to understand computer networks and digital data communications with a focus on Internet protocols: Application layer architectures (client/server, peer-to-peer) and protocols (HTTP-web, SMTP-mail, etc), Transport layer operation: (reliable transport, congestion and flow control, UDP, TCP); Network layer operation - (routing, addressing, IPv4 and IPv6), Data Link layer operation (error detection/correction, access control, Ethernet, 802.11, Physical Layer operation. Similarly, selected topics such as: network security (Network attack, cryptography, VPN, firewall).

Course objectives:

After completion of this course students will be able to:

1. Gain a good understanding of the architecture of computer networks.
2. Identify and understand various hardware devices and software used in computer networks.
3. Learn different types of protocols used for transmission of data.
4. Use routing and addressing.
5. Setup small home/office networks.

Course Contents:

Theory

Unit 1. Introduction [4 Hrs.]

1.1. Definition, Advantages and disadvantages, applications
1.2. Communication system: Analog and digital, Block diagram
1.3. Network as platform, Internet architecture, Trends in networking
1.4. Data Transmission: Analog and digital transmission
1.5. Transmission impairment

Unit 2. Network Architecture and Hardware/Software [9 Hrs.]

2.1. Network topologies
2.2. Network types: PAN, LAN, MAN, WAN, Intranet, Internet, Extranet
2.3. Layered network architecture, protocols, interfaces, services
2.4. OSI reference model
2.5. TCP/IP model
2.6. Network workstation and server: Hardware and software requirements
2.7. Client server and peer-to-peer model
2.8. Network devices: Repeater, Hub, NIC, Bridge, Switch, Router, Gateway

Unit 3. Physical Layer [4 Hrs.]

3.1. Channel bandwidth and throughput; Propagation time; transmission time
3.2. Transmission media:
  3.2.1. Guided: Coaxial, twisted-pair, fiber-optic
  3.2.2. Unguided: radio waves, microwaves, infrared, satellite
3.3. Introduction of Frame Relay, ATM, ISDN, PSTN and X.25

Unit 4. Data link Layer **[6 Hrs.]**

4.1. Introduction and function of data link layer and its issues
4.2. Framing
4.3. Flow Control issues at data link layer
4.4. Piggybacking and Sliding Window Protocol
4.5. Error Control issues at data link layer
4.6. Error Detection Method and Error Correction Method
4.7. Data Link Layer Protocol: HDLC, PPP

Unit 5. LAN Architectures/standards **[4 Hrs.]**

5.1. Introduction of LAN standards and architecture
5.2. Media access control, MAC address
5.3. ALOHA, FDDI, VLAN, CSMA/CD, Token ring, Token bus and IEEE 802.3, 802.4, 802.1(wireless LAN)

Unit 6. Network Layer **[8 Hrs.]**

6.1. Internetworking
6.2. Circuit switching and packet switching
6.3. Addressing issues at network layer
6.4. IP address, Different classes, Private and Public address
6.5. Subnet mask and sub-netting: Classless addressing; Network Address Translation (NAT)
6.6. Routing and its necessity; static and dynamic routing; interior and exterior routing
6.7. Dynamic routing and Static routing
6.8. Network layer protocols
6.9. Introduction to IPV6 and its necessity

Unit 7. Transport Layer **[4 Hrs.]**

7.1. Transport layer issues:
  7.1.1. Congestion control
  7.1.2. Flow control
  7.1.3. Quality of service
7.2. Transport layer addressing sockets, Port
7.3. Segmentation and reassembly
7.4. Connection oriented and connectionless service
7.5. TCP, UDP

Unit 8. Application Layer **[4 Hrs.]**

8.1. Application layer and its function
8.2. Electronic mail: SMTP, POP3, IMAP
8.3. File transfer: FTP, PUTTY, WinSCP
8.4. Web: HTTP, HTTPs
8.5. Dynamic host configuration protocol (DHCP)
8.6. DNS, WWW

Unit 9. Network Security **[2 Hrs.]**

9.1. Properties of Secure Communication
9.2. Network attacks: Active and Passive attacks

9.3. Cryptography: Symmetric Key and public key, Digital signature
9.4. Firewalls
9.5. Virtual private network

Practical: **[45 Hrs.]**

In practical, students should be able to set up small networks. They should be able to configure network hardware and network software. Following lab exercises may be helpful.

1. Configuration of network interface card and various network devices like hub, switch, router, etc.
2. Cabling: Construction of straight- through and cross-over cable and verify the physical layer connectivity.
3. Configuration of workstation PC
4. Setup peer-to-peer networking and verify it
5. Configuration of server for client server networking; also verify it.
6. Familiarization with basic network commands: Observing IP address and MAC address, Setting IP address and default gateway in PC, Verifying network layer connectivity
7. Configure the PC to obtain IP from DHCP, Release the leased IP, Renew IP (for this there should a DHCP server) -6 and 7 merge
8. Create multiple networks and route packets across multiple networks using static routing
9. Dynamic routing (e.g., RIP) and default route
10. Configure HTTP, FTP, DHCP server and verify it
11. Configuration of DNS and e-mail server
12. Design of local area network (LAN)
13. Case study: Organizational visit to study existing network system

Note: Use packet Tracer software for performing the above practical lab works

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Network Architecture and Hardware/software	9	16
3	Physical Layer	4	7
4	Data link Layer	6	11
5	LAN Architectures/standards	4	7
6	Network Layer:	8	14
7	Transport Layer	4	7
8	Application Layer	4	7
9	Network Security	2	4
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Behrouz Forouzan, “Data Communications and Networking”, Edition 5, Tata McGraw-Hill., 2012.
2. Andrews S. Tanenbaum, David J Wetherall, “Computer Networks”, Edition 5, Pearson Education, 2012.
3. William Stallings, “Data & Computer Communications”, PHI, Edition 6, 2012.

4. Jerry Fitzgerald, Alan Dennis, “Business Data Communications & Networking”, John Wiley & Sons Inc, 2010.

Operating System
EG3103CT

Year: III **Total: 5 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: hours/week
Practical: hours/week
Lab: 2 hours/week

Course description:
This course includes the basic concepts and core structure, functions and design principles of operating system. It consists of the various functions of operating system like process and memory management, file and I/O Management, Deadlock Management and Security. The course gives ideas in designing the operating system and its services.

Course objectives
After completion of this course students will be able to:
1. Describe the functions of operating system.
2. Explain design of the operating system and its components.
3. Demonstrate and simulate the algorithms used in operating system.

Course Contents:

Theory

Unit 1. Introduction **[6 Hrs.]**
- 1.1. Operating system and its functions
- 1.2. Evolution of Operating System
- 1.3. Types of Operating System
- 1.4. Operating System Components
- 1.5. Operating System Services: System Call, Shell
- 1.6. Example of Operating System: Unix, Linux, Windows, Handheld OS

Unit 2. Process Management **[10 Hrs.]**
- 2.1. Process Vs Program, Process States, Process Models, Process Control Box
- 2.2. Process Vs Thread, Thread Models, Multithreading
- 2.3. Process Scheduling Criteria, Algorithms and Goals
  - 2.3.1. Batch System: FIFO, SJF, SRTN
  - 2.3.2. Interactive System: RR, HRRN
- 2.4. Critical Section, Race Condition, Mutual Exclusion
- 2.5. Producer Consumer Problem

Unit 3. Memory Management **[10 Hrs.]**
- 3.1. Concept of Multiprogramming
- 3.2. Memory Management functions
- 3.3. Multiprogramming with fixed partition
- 3.4. Multiprogramming with variable partition
- 3.5. Internal Vs External fragmentation
- 3.6. Memory Allocation: First Fit, Worst Fit, Best Fit
- 3.7. Concept of Paging and Page fault

Unit 4. Deadlock Management **[8 Hrs.]**
- 4.1. Deadlock Concept
- 4.2. Deadlock Conditions

4.3. Deadlock Handling Strategies:
  4.3.1. Deadlock Prevention
  4.3.2. Deadlock Detection
  4.3.3. Deadlock Avoidance
  4.3.4. Recovery from Deadlock
4.4. Banker's Algorithm

Unit 5. File and Input/output Management [6 Hrs.]

5.1. File: Naming, Structure, Types, Access, Attributes, Operations, Directory Systems
5.2. File System Layout
5.3. Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes
5.4. Principle of I/O Hardware and Software
5.5. Disk Formatting, Disk Arm Scheduling, Stable Storage, Error Handling

Unit 6. Security [5 Hrs.]

6.1. Security Goals
6.2. Security Attacks
6.3. Active and Passive Attacks
6.4. Cryptography Basics
6.5. Access Control
6.6. Protection Mechanisms

Practical: [30 Hrs.]

1. Installation of Virtual Machine, Linux and Windows [4 Hrs.]
2. Linux Basic Commands [2 Hrs.]
3. Implementation of Process Scheduling Algorithms [8 Hrs.]
4. Process Creation, Termination [4 Hrs.]
5. Inter process communication [4 Hrs.]
6. Implementation of Banker's Algorithm [4 Hrs.]
7. Implement some Memory Management Schemes [4 Hrs.]

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Process Management	10	18
3	Memory Management	10	18
4	Deadlock Management	8	13
5	File and I/O Management	6	11
6	Security	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, PHI
2. Stalling William, "Operating Systems", 6th Edition, Pearson Education
3. Silbcrschatz A.,Galvin P., Gagne G., "Operating System Concepts", 8th Edition, John Wiley and Sons

Computer Repair and Maintenance

EG3104CT

Year: III **Total: 5 hours /week**

Part: I **Lecture: 2 hours/week**

Tutorial: hour/week

Practical: hours/week

Lab: 3 hours/week

Course Description:

This course deals about fundamental concept, theories and popular principles of repair and Maintenance systems of computer. The major focus is trouble shooting, repairing and maintenance into real-life by utilizing the knowledge and skill of computer hardware and software. This makes the learning-teaching process more interactive, skillful and interesting.

Course Objectives:

At the end of the course student will be able to

1. Explain basic operation of computer
2. Perform the maintenance of computer, its accessories and peripherals
3. Take Care of computer and its accessories

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

1.1. Definition of Computer, Hardware and software
1.2. Computer Repair and Maintenance
1.3. Importance of Computer Repair and Maintenance
1.4. Hardware maintenance
1.5. Software Based maintenance

Unit 2. System Case **[2 Hrs.]**

2.1. Style and size
2.2. Form Factors
2.3. Switches
2.4. LEDs
2.5. Drive bay

Unit 3. Power Supply **[2 Hrs.]**

3.1. Ratings
3.2. Working Principle
3.3. Block Diagram
3.4. SMPS Concept

Unit 4. Mother Board and System Devices **[2 Hrs.]**

4.1. Form factor
4.2. Parts
4.3. Chipset and controller
4.4. Buses
4.5. BIOS

Unit 5. Processor **[3 Hrs.]**

5.1. Arithmetic Logic Unit (ALU)
5.2. Control Unit, Register
5.3. Buses (Data bus, Address Bus, Control Bus)

Unit 6. UPS **[2 Hrs.]**

6.1. Introduction to UPS
6.2. Importance of UPS
6.3. UPS system Maintenance

Unit 7. Input Devices **[2 Hrs.]**

7.1. Scanner
  7.1.1. Basic operation of Scanner
  7.1.2. Types of Scanners
  7.1.3. Resolution
  7.1.4. Port/slot
7.2. Repair of Scanner

Unit 8. Storage devices **[4 Hrs.]**

8.1. Hard disk (Construction and Operation, Speed, Disk Geometry, Track, Cylinder and sectors, Capacity, Partitioning and Formatting)
8.2. Compact Disk (CD/DVD, Color book Specification, Performance and Reliability, CD/R-W principle)
8.1. External HDDs Vs SSDs

Unit 9. Output devices **[3 Hrs.]**

9.1. Monitor
  9.1.1. CRT (Simple working Principle)
  9.1.2. LED
9.2. Printer
  9.2.1. Basic Operation & Installation of Printer
  9.2.2. Types of Printers
  9.2.3. Resolution
  9.2.4. Port/slot
9.3. Repair of printer

Unit 10. System Care **[8 Hrs.]**

10.1. Preventive Maintenance
  10.1.1.General system care factors
  10.1.2.Cooling and Ventilation
  10.1.3.Power protection
  10.1.4.Data loss and virus protection
10.2. Data problem detection
  10.2.1. Virus detection and protection
  10.2.2. Background of viruses
  10.2.3. Virus scanning and antivirus software
10.3. Backup and Disaster Recovery:
  10.3.1.Risk of data,
  10.3.2.Backup methods devices and media,
  10.3.3.Backup scheduling,

10.3.4. Recovery of data

Practical: **[45 Hrs.]**

1. **Identification and Selection of Required Tools**
   - 1.1. **Physical Assembly procedure:**
     - 1.1.1. Safety procedure
     - 1.1.2. System case selection and preparation
     - 1.1.3. layout of mother board
     - 1.1.4. Secondary storage devices fitting and connections
     - 1.1.5. Memory insertion
     - 1.1.6. Power Connection
     - 1.1.7. Processor and heat sink fitting
     - 1.1.8. Connection of indicators and switches
     - 1.1.9. Setting of jumpers
     - 1.1.10. Insertion of peripheral cards like audio, NIC, Modem, Video Cards etc if necessary
   - 1.2. **Installation of Operating Systems:**
     - 1.2.1. Management of Hard Disk (Partition and formatting)
     - 1.2.2. BIOS setup and installation of Operating system (Windows, Linux etc.)
     - 1.2.3. Installation of Device drivers, Configuration, Installation of Application Programs and antivirus
   - 1.3. **Connecting Multiple Computers Together:**
     - 1.3.1. Construction of UTP cable (Straight through and Cross-cable, connecting through HUB, Switch or Direct connection, Assigning IP numbers and testing of networking
   - 1.4. **Troubleshooting and Repairing Techniques:**

     System Case, LEDs or Case Buttons, Key Lock, Power Sources and Power Protection Devices Cooling fans, air circulation, Motherboard and System Devices, General Failures, CMOS Memory or Real-Time Clock, System BIOS, Resources and Expansion Cards, Processor, System Memory, Memory Not Recognized, Out of Memory Problems, Performance Issues, Video Cards, Failure or Improper Operation, Image Quality Problems, Performance or Video Mode Issues, Monitors, Failure or Improper Operation, Hard Disk Drives, Booting or Operation Problems, Configuration Issues, Disk Compression Issues, Drive Letter Issues, File System Problems, Operating System, CD/DVD- ROM Drives, Drive Not Recognized, Configuration Problems, Audio Issues, Peripheral I/O Ports, Keyboards, Mice, Modems, Network Card, Operation and Connection Problems, Speed Issues, Applications Program Failure.

2. **Installation and maintenance of peripheral equipment**
   - 2.1. **Printer**
     - 2.1.1. Installation of printer driver
     - 2.1.2. Replacement of tonner/cartridge
     - 2.1.3. Troubleshoot and maintenance of Printer
   - 2.2. **Scanner**
     - 2.2.1. Identification of Scanner component
     - 2.2.2. Connection of scanner
     - 2.2.3. Installation of scanner device

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	3
2	System Case	2	3
3	Power Supply	2	3
4	Mother Board and System Devices:	2	3
5	Processor	3	4
6	UPS	2	3
7	Input devices	2	3
8	Storage Devices	4	5
9	Output Devices	3	4
10	System Care	8	9
	Total	**30**	**40**

* There may be minor deviation in marks distribution.

Reference:

1. Winn, L. Rosch (1994). *The hardware Bible* (3rd Edition). Brady Publishing
2. Peter, Norton (2000). *Introduction to Computers* (4th Edition). New York city: McGraw-Hill Higher Education
3. Mark, Minasi (1998). *The Complete PC Upgrade and Maintenance Guide.* United States: Sybex Inc
4. Mueller, Scott (2015). *Upgrading and Repairing PCs (22nd ed).* Que Publishing

Data Mining and Data Warehousing
EG3105CT

Year: III **Total: 6 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: … hour/week
Practical: … hours/week
Lab: 3 hours/week

Course description:
This course studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. The course will cover all these issues and will illustrate the whole process by examples.

Course objectives:
After completion of this course students will be able to:
1. Explain the concept of Data preprocessing, Data Mining and Data Warehousing
2. Understand Data preprocessing Techniques.
3. Discuss multi-dimensional data representation and OLAP operations
4. Understand the concept and use of clustering, classification, and association rule mining algorithms.
5. Discuss on advanced concept and trends of Data Mining and Data Warehousing.

Course Contents:

Theory

Unit 1. Introduction to Data Mining [5 Hrs.]
- 1.1. Basic concepts of Data Mining
- 1.2. Use and benefits of Data Mining
- 1.3. Application of data mining
- 1.4. Knowledge Discovery Process (KDD)
- 1.5. Data Mining Functionalities
- 1.6. Data Mining System Architecture

Unit 2. Data Preprocessing [5 Hrs.]
- 2.1. Data Objects and attribute types
- 2.2. Statistical description of data
- 2.3. Data Preprocessing Concepts
- 2.4. Data Preprocessing
  - 2.4.1. Data Cleaning
  - 2.4.2. Data Integration
  - 2.4.3. Data Reduction
  - 2.4.4. Data Transformation

Unit 3. Data Warehousing and Online Analytical Processing (OLAP) [8 Hrs.]
- 3.1. Basic concepts of data warehousing
- 3.2. Use and benefits of data warehousing
- 3.3. Application of data warehousing
- 3.4. Characteristics of Data Warehouse
- 3.5. Operational Database Vs. Data Warehouse
- 3.6. Data Warehouse Architecture
- 3.7. Data Warehouse Models: Enterprise Warehouse and Data marts

3.8. Multi-dimensional Data, Data Cube
3.9. Data Warehouse Schemas
  3.9.1. Star Schema
  3.9.2. Snowflake Schema
  3.9.3. Fact Constellation Schema
3.10. Fact tables and Dimensions Tables
3.11. OLAP Operations in Multidimensional data models: Roll-up, Drill-Down, Slice and Dice, and Pivot (Rotate) Operations
3.12. Types of OLAP Servers: ROLAP, MOLAP, HOLAP

Unit 4. Mining Frequent Pattern and Associations [7 Hrs.]

4.1. Frequent patterns, Market basket analysis, Frequent Item sets, Support and Confidence, Association Rules
4.2. Finding Frequent Itemset (Apriori Algorithm)
4.3. Limitation and improving Apriori Algorithm

Unit 5. Classification [8 Hrs.]

5.1. Concept of Classification, Learning and Testing of Classification
5.2. Decision Tree Induction
5.3. Bayesian Classification
5.4. Rule Based Classification
5.5. Linear Regression

Unit 6. Clustering [8 Hrs.]

6.1. Concept and Definition of Clustering
6.2. Clustering Methods and General Characteristics
  6.2.1. Partitioning Method (k-Means, k-Medoids)
  6.2.2. Hierarchical Method (Agglomerative, Divisive)

Unit 7. Data Mining Trends and Applications [4 Hrs.]

7.1. Multimedia Data Mining
7.2. Text mining
7.3. Web Mining
  7.3.1. Web Content Mining
  7.3.2. Web Usage Mining
  7.3.3. Web Structure Mining
7.4. Data Mining support in SQL Server
7.5. Data Mining in Oracle
7.6. Data Mining Standards
7.7. Importance of data mining in Marketing, E- commerce and CRM
7.8. Aspects of Security and Privacy in Data Mining

Practical: [45 Hrs.]

1. Design data warehouse by using SQL Server or Oracle.
2. Implement OLAP operations
3. Implement clustering algorithms K-means and K- medoid by using Weka
4. Implement classification algorithms Naïve-Bayes and decision trees by using Weka
5. Implement regression algorithms by using Weka
6. Implement association mining algorithms by using Weka

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction to Data Mining	5	8
2	Data Preprocessing	5	8
3	Data Warehousing and Online Analytical Processing (OLAP)	8	16
4	Mining Frequent Pattern and Associations	7	12
5	Classification	8	12
6	Clustering	8	16
7	Data Mining Trends and Applications	4	8
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Jiawei Han, Micheline Kamber, Jian Pei; *Data Mining: Concepts and Techniques*, Morgan Kaufman Publication, 3rd Edition
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, *Introduction to DataMining*, Pearson Publication, First Edition
3. Charu C. Agrawal, *Data Mining: The Textbook*, Springer Nature Publication, First Edition
4. Sam Anahory, Dennis Murray, *Data warehousing In the Real World***,** Pearson Education.
5. Alex Berson and Stephen J. Smith, *Data Warehousing, Data Mining & OLAP*, Tata McGraw Hill, 1st Edition.

Geographical Information System
(Elective I)
EG3106CT.1

Year: III **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course is designed to introduce students a computer-based GIS, Geographic Information Systems, and its applications to spatial data management as a tool to understand the world by describing and explaining the human relationship to the physical environment.

Course objectives:
After completion of this course students will be able to:
1. Explain GIS, development and components of GIS
2. Explain data capturing techniques
3. Analyze spatial and non- spatial data

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**
- 1.1. Historical Background
- 1.2. Scope and application areas
- 1.3. Benefits and importance
- 1.4. Functional components
- 1.5. GIS in Organizations
- 1.6. Elements of GIS

Unit 2. Coordinate System **[4 Hrs.]**
- 2.1. Geographic coordinate system
- 2.2. Map Projections
- 2.3. Commonly used map projection system
- 2.4. projected coordinate system

Unit 3. Data Models **[7 Hrs.]**
- 3.1. Introduction, Common Spatial Data Models
- 3.2. Vector Data, Raster Data
- 3.3. Other Data Models:
  - 3.3.1. TINs
  - 3.3.2. Object Data Model
  - 3.3.3. 3-d Data Model
- 3.4. Data and File Structure

Unit 4. Maps, Digitization and Output **[10 Hrs.]**
- 4.1. Map concept
  - 4.1.1. Map elements
  - 4.1.2. Map layers

4.1.3. Map scales and representation
4.1.4. Map Boundaries and Spatial Data

4.2. Digitizing
4.2.1. The Digitizing Process
4.2.2. Digitizing Errors
4.2.3. Node and Line Snapping

4.3. Reshaping
4.3.1. Line Smoothing and Thinning
4.3.2. Scan Digitizing, Editing Geographic Data
4.3.3. Features Common to Several Layers

4.4. Coordinate Transformation:
4.4.1. Control Points
4.4.2. The Affine Transformation
4.4.3. Other Coordinate Transformations
4.4.4. Caution When Evaluating Transformations
4.4.5. Projection Vs Transformation

4.5. Output: Maps, Digital Data, Metadata

Unit 5. Capturing Data [5 Hrs.]

5.1. Different methods of data capture
5.2. Data preparation
5.3. Conversion and integration
5.4. GPS
5.5. Remote Sensing

Unit 6. Spatial Analysis and Terrain Analysis [9 Hrs.]

6.1. Introduction
6.2. Selection and Classification
6.3. Proximity Functions and Buffering
6.4. Overlay: Raster Overlay, Vector Overlay
6.5. Terrain Analysis:
6.5.1. Introduction
6.5.2. Slope and Aspect
6.5.3. Hydrologic Functions, Profile Plots, Contour Lines
6.5.4. Viewsheds, Shaded Relief Maps

Unit 7. Spatial Data Infrastructure [6 Hrs.]

7.1. SDI concepts and its current trend
7.2. The concept of metadata and clearing house
7.3. Critical factors around SDIs

Practical: [45 Hrs.]

1. Handle GIS devices
2. ArcGIS installation
3. Explore interactive GIS, create map layouts, Reuse a custom map layout
4. Build a file geodatabase, Use Arc Catalog utilities, modify an attribute table, Join tables
5. Examine metadata, Work with map projections, learn about vector data formats, Explore sources of vector maps

6. Digitize polygon features, use advanced edit tools, digitize point features, Digitize line features
7. Map Designing using tools

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Coordinate system	4	7
3	Data Models	7	12
4	Map, Digitization and output	10	18
5	Capturing Real World	5	9
6	Spatial Analysis & Terrain Analysis	9	16
7	Introduction to Spatial Data Infrastructure	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. De By R, Knippers R.A, sun Y. Principles of geographic information systems: An introductory textbook, international institute for Geoinformation science and Earth observation, the Netherlands
2. Paul B, GIS Fundamentals: A First Text on Geographic Information Systems Fifth Edition,
3. Chang K.T. Introduction to Geographic Information System

E-Commerce
(Elective I)
EG3106CT.2

Year: II **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course Description:
This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. This course deals with the introduction, different business models for e-Commerce, concept of mobile computing, different types of on-line business systems, techniques and implementation for electronics payment system, and legal considerations in e-Commerce.

Course Objectives:
After completing this course, the students will be able to
1. Explain the steps required to set-up your E-commerce website for advertising purposes
2. Introduce the e-commerce.
3. Identify security issues of e-Commerce and e-commerce related Public Policy.
4. Explain the types of payment system and payment gateway.
5. Describe the legal and ethical issues of e-commerce and cyber law,
6. Familiarize with online marketing.

Course Contents:

Theory

Unit 1. Fundamental concept of e-Commerce [6 Hrs.]
- 1.1. Definition of Electronic Commerce
- 1.2. Scope of Electronic Commerce
- 1.3. Electronic E-commerce and the Trade Cycle
- 1.4. Emergence of Internet and commercial use of Internet
- 1.5. E-commerce Models, Personal web server, Internet information server, ASP page Contain scripts, Contain objects and components, Database access,
- 1.6. Application of E-Commerce

Unit 2. Business Models of e-Commerce [6 Hrs.]
- 2.1. Business to Business (B2B)
- 2.2. Business to Consumer (B2C)
- 2.3. Consumer to Consumer (C2C)
- 2.4. Development of B2B e-commerce
- 2.5. Difference between B2C and B2B e-Commerce
- 2.6. e-Procurement
- 2.7. Just in Time Delivery
- 2.8. Integration with Back-end Information System
- 2.9. Electronic marketing in Business-to-Business
- 2.10. Electronic Data Interchange (EDI)
- 2.11. EDI: The Nuts and Bolts, EDI & Business
- 2.12. Auctions and Services from Traditional to Internet Based EDI

Unit 3. E-marketing and Advertising Concepts [5 Hrs.]

3.1. Define E-marketing
3.2. Explain Traditional Marketing
3.3. Online Marketing vs offline marketing
3.4. Tools for online and offline marketing
3.5. Issues with online marketing
3.6. Model of an online video store

Unit 4. Mobile and Wireless Application [5 Hrs.]

4.1. Define Mobile and wireless
4.2. Growth of Mobile Commerce
4.3. Wireless Application Protocol (WAP)
4.4. Use of technologies for mobile commerce
4.5. Architecture of Wireless Application Protocol
4.6. Generations in Wireless Communications
4.7. Security Issues related to Wireless Communication

Unit 5. The network infrastructure for e-commerce [8 Hrs.]

5.1. Network and internets
5.2. Network routers
5.3. Internet protocol suites
5.4. Internet naming convention, (URLs, TCP, FTP, ISP, Telnet, Search engine)
5.5. Broadband technologies (ADSL, Wi-Fi, LTE (4G), Bluetooth)
5.6. Web-based client/server
5.7. Software agents, Types of software agents
5.8. Internet Security
5.9. Multimedia delivery
5.10. Managerial issues

Unit 6. Electronic Payment System (EPS) [4 Hrs.]

6.1. Define Electronic payment system
6.2. Types of electronic payment system
6.3. Digital token-based E-payment system
6.4. Smart Cards & E-payment systems
6.5. Credit card-based payment systems
6.6. Digital wallet (eSewa, Khalti, ConnectIPS)
6.7. Online banking facilities of banks (Nepali banks)
6.8. Risk factor in electronic payment system

Unit 7. Introduction to Entrepreneurship [6 Hrs.]

7.1. Entrepreneurship development
7.2. Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager
7.3. Attributes and characteristics of a successful Entrepreneur
7.4. Entrepreneurial Culture
7.5. Legal and Ethical Issues

Unit 8. Public Policy [5 Hrs.]

8.1. From legal issues to privacy
8.2. E-commerce related legal incidents

8.3. Ethical and other public policy issues
8.4. Protecting privacy
8.5. Protecting intellectual property
8.6. Internet indecency and censorship
8.7. Taxation and encryption policies
8.8. E-commerce Law
8.9. Forms of Agreement
8.10. Government policies

Practical: **[45 Hrs.]**

1. Project should be done by students in any e-commerce site (the project should include: business model, payment mode, network infrastructure, marketing strategy, SWOT analysis and working process of site) (Refer Amazon, Alibaba, E-bay, Paypal etc.)
2. Study visit to fully developed E-Commerce management organization.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Fundamental concept of E-Commerce	6	11
2	Business Models of e-Commerce	6	11
3	E-marketing and Advertising Concepts	5	9
4	Mobile and Wireless Application	5	9
5	The network Infrastructure for E-commerce	8	13
6	Electronic Payment System (EPS)	4	7
7	Introduction to Entrepreneurship	6	11
8	Public Policy	5	9
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Noel Jerke, April 2012. E-Commerce Developer's Guide to Building Community and using Promotional Tools. Sybex Inc.
2. Kenneth C. Laudon and Carol Guercio Traver, (11^{th} edition), 2015. E-commerce 2015 business, technology, society. Pearson
3. Janice Reynolds, (2nd edition, 2015. The Complete E-Commerce Book, Design, Build & Maintain a Successful Web-based Business. Focal Press
4. Amir Manzoor, (1^{st} edition), 2015. E-commerce 2016. Printed in the United States of America.

Management Information System
(Elective I)
EG3106CT.3

Year: III **Total: 7 hours /week**
Part: I **Lecture: 3 hours/week**
Tutorial: 1 hour/week
Practical: hours/week
Lab: 3 hours/week

Course Description:
The main aim of this course is to introduce the Management of Information Systems (MIS). Managing information systems has become a task for all levels of managers and all function areas of the business. This MIS course is designed to familiarize students with the concepts related to the utilization of information technology in business organizations. This course will focus on technical and managerial aspects of information technology adoption in the organization. This course should provide the student with knowledge of the core principles of MIS, focusing on breadth rather than depth of knowledge. In this course has included case studies, group assignments, and related software exercises that will provide an opportunity to apply MIS concepts to real-world applications.

Course Objectives:
After completing this course, the student will able to:
1. Explain the significance of information systems in organizations, Strategic management processes and the implications for the management.
2. Describe different types of management information systems.
3. Identify the basic technologies used in the field of Management Information System.
4. Explain the developments of electronic commerce and the role of Internet.
5. Describe the processes of developing and implementing information systems.
6. Familiarize with ethical and social issues related to information system.

Course contents:

Theory

Unit 1. Foundation of Information System [7 Hrs.]
- 1.1. Introduction to information system
- 1.2. Role of information system in Business
- 1.3. Components of Information Systems
- 1.4. Types of information systems
- 1.5. Effectiveness and efficiency criteria in information system

Unit 2. An overview of Management Information Systems [6 Hrs.]
- 2.1. Structure of a Management information system
- 2.2. Structure of a Management information system
- 2.3. MIS versus Data processing
- 2.4. Decision Making In MIS
- 2.5. MIS & Information Resources Management

Unit 3. Concept of Planning [8 Hrs.]
- 3.1. Concept of organizational planning
- 3.2. The Planning Process
- 3.3. Computational support for planning

3.4. The importance of planning
3.5. Business applications of information technology
3.6. Information System for Business Operations (SDLC)
3.7. Information System for Strategic Advantage
3.8. Decision Support Systems and its benefits and characteristic

Unit 4. Managing Information Technology [5 Hrs.]

4.1. Enterprise & global management
4.2. Security & Ethical challenges
4.3. Planning & implementing changes
4.4. Information Technology Trends

Unit 5. MIS in functional areas of business [7 Hrs.]

5.1. Accounting information systems
5.2. Geographical information systems
5.3. Human resource information systems
5.4. Inventory information systems
5.5. Manufacturing information systems
5.6. Marketing information systems
5.7. Quality information systems

Unit 6. Information security [6 Hrs.]

6.1. Security threats and vulnerability
6.2. Controlling security threat and Vulnerability
6.3. Management security threat in e-Business
6.4. Disaster management
6.5. MIS and Security Challenges
6.6. Firewall

Unit 7. Knowledge based systems [3 Hrs.]

7.1. Artificial intelligence
7.2. Expert systems
7.3. Neural networks

Unit 8. Office information system [3 Hrs.]

8.1. Nature of office
8.2. Types of office information systems
8.3. Client server computing

Practical: [45 Hrs.]

Project Work:

Students should complete at least one MIS Project on the following Topics by including the above contents.

1. Restaurant Information System
2. College Management System

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Foundation of Information System	7	12

2	An overview of Management Information Systems	6	11
3	Concept of planning	8	14
4	Managing Information Technology	5	10
5	MIS in functional areas of business	7	12
6	Information security challenges in e-Enterprises	6	11
7	Knowledge based systems	3	5
8	Office information system	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Brian (2004). *Introduction to Information System*. New York: MCGRAW HILL.
2. Murdick (1971). *Information System for Modern* Management New Jersey:PHI.
3. Jawadekar,S.S(2019). *Management Information System* (6th ed). India: MC GRAW HILL.

Minor Project

EG3107CT

Year: III **Total: 3 hours /week**

Part: I **Lecture: … hours/week**

Tutorial: … hour/week

Practical: 3 hours/week

Lab: … hours/week

Course description:

This course provides students with an idea of how to transform the theoretical knowledge gained in earlier semesters into practical applications. The students will build a real-life project during this course using the knowledge gained in earlier semesters.

Course objectives:

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

1. Learn and gain the knowledge about the programming tool they used to implement the real-life project.
2. Plan, design, develop and implement the real-life problem as a project.
3. Formulate project documentation and oral presentation for his/her final year project.

Project Overview:

1. Group formation (3-4 persons / group)
2. Project concept development
    a. Finding Project concept
    b. Scope of project
    c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

The project should:

1. Be intended to develop an Computer Engineering solution to a practical problem
2. Be carried out using an engineering approach
3. Emphasize design
4. Be carried out in a group (3-4 person/group)
5. Normally result in the production of a piece of software
6. Include technical documentation based on documentation guideline.
7. Be fully described from inception to completion in a written report produced to a good level of professional competence

Procedure:

1. Explain the minor project concept in a class by project teachers.
2. Preliminary selection of topic.
3. Discussion with department regarding the feasibility/practicality of the project (e.g. cost, usefulness, market).
4. Finalization of topic.

5. Submission of the detail proposal (Extensive literature review).
6. After approval by project teachers, start of minor project work in laboratory /home.
7. Monitoring of the work progress by project teachers and report to department.
8. A mid-term progress report should be submitted by the student on the date fixed by department.
9. Presentation of mid-term progress of the minor project along with report.
10. Final presentation of minor project should be conducted by the department and should be evaluated by the project teachers in the presence of other teachers in the related field, not involved in minor projects, but from the same department.
11. Students must submit a group report in the format prescribed below.

Requirements for report writing:
Font Name: Times New Roman
Top Margin: 1 inch
Left Margin: 1 inch
Right Margin: 1 inch
Bottom Margin: 1 inch
Gutter: 0.25 inch (left)
Header and Footer: 0.5 inch
Line Spacing: Single
Paragraph Spacing: 8 pt
Font Size: 12 pt (for normal text)
Follow following standard for headings

1. Heading1 (16pt, Bold)
1.1. Heading2 (14pt, Bold)
1.1.1. Heading3 (13pt, Bold)
1.1.1.1. Heading4 (12pt, Bold)

Arrangement of Contents in a report:
The sequence of contents in a major project report is as follows
1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary
- Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.
6. Table of Contents
- The table of contents should list all material following it as well as any material which precedes it.
7. List of Figures (if any)
- The list should use exactly the same captions as they appear below the figures in the text.
8. List of Tables (if any)
- The list should use exactly the same captions as they appear above the tables in the text.
9. List of Symbols (if any)
- The list should provide the detail of the symbols used in the report.
10. Abbreviations (if any)

- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.

11. Main body
    - 11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features,
      Feasibility, System Requirement)
    - 11.2. Chapter 2: Literature Review
    - 11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
    - 11.4. Chapter 4: Result and Analysis
    - 11.5. Chapter 5: Conclusion, Recommendation and Limitations
12. References
    - The reference material should include the author name, title, year. Do not mention the references of the websites in the report.
13. Appendices (if any)
    - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

Page numbering: The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc at the bottom.

Figure and Table numbering: It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually the figure captions are written below the figure and table captions on top of the table.

Evaluation Scheme:
The marks should be evaluated by project teachers as well as other teachers in the related field on the basis of:

S.N.	Topic	Marks Distribution
1	Proposal Defense	10
2	Mid-term progress report/presentation	20
3	Final project report/presentation	70 (project coordinator =10 supervisor =20 external examiner =40)
	Total	**100**

Detailed evaluation scheme:

S.N.	Topic	Marks Distribution
1	Presentation skill	20%
2	Team work	10%
3	Understanding of project work and related theory	20%
4	Project demonstration	20%
5	Project Applications	10%
6	Documentation	20%
	Total	**100%**

Third Year/ Second Part

S.N.	Course Code	Subject
1	EG3201CT	Multimedia System
2	EG3202CT	Internet of Things
3	EG3203CT	Information Security
4	EG3201MG	Entrepreneurship Development
		Elective – II
5	EG3204CT.1	a) E-Governance
	EG3204CT.2	b) Computer Simulation and Modeling
	EG3204CT.3	c) Artificial Intelligence
6	EG3205CT	Major Project

Multimedia System

EG3201CT

Year: III **Total: 6 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

The main objective of this course is to give the fundamental knowledge of multimedia technologies and cover three main domains of Multimedia Systems: Devices, Systems and applications

Course objectives:

After completion of this course students will be able to:

1. Identify basics of multimedia and multimedia system and its architecture.
2. Understand different multimedia components.
3. Explain file formats for different multimedia components.
4. Analyze the different compression algorithms.
5. Apply different Designing techniques in multimedia system

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**

1.1. Definition
1.2. Uses of multimedia
1.3. Components of multimedia
1.4. Multimedia building blocks
1.5. Multimedia and Personalized Computing
1.6. Medium
1.7. Multimedia system and properties
1.8. Data Streams Characteristics
1.9. Data Stream Characteristics for Continuous Media, Information Units

Unit 2. Sound / Audio System **[3 Hrs.]**

2.1. Concepts of sound system
2.2. Music and speech
2.3. Speech Generation
2.4. Speech Analysis
2.5. Speech Transmission

Unit 3. Images and Graphics **[4 Hrs.]**

3.1. Digital Image Representation
3.2. Image and graphics Format
3.3. Image Synthesis
3.4. Analysis and Transmission

Unit 4. Video and Animation **[4 Hrs.]**

4.1. Video signal representation
4.2. Computer- Based animation
4.3. Animation Language

4.4. Methods of controlling Animation
4.5. Display of Animation
4.6. Transmission of Animation

Unit 5. Multimedia Applications Development [4 Hrs.]
5.1. Multimedia systems development cycle
5.2. Planning and costing
5.3. Designing
5.4. Developing and producing
5.5. Testing and debugging
5.6. Delivering
5.7. User Interface techniques

Unit 6. Data Compression [4 Hrs.]
6.1. Need for data compression
6.2. Compression basics
6.3. Lossless compression
6.4. Lossy compression
6.5. LZW Compression

Unit 7. Designing Multimedia [4 Hrs.]
7.1. Development phases and development team
7.2. Analysis phase
7.3. Design phase
7.4. Development phase
7.5. Implementation phase
7.6. Evaluation and testing phase

Unit 8. Application Subsystem [4 Hrs.]
8.1. Application Subsystem
8.2. Transport subsystem
8.3. Quality of service and resource management
8.4. Trends in collaborative Computing
8.5. Trends in Transport Systems
8.6. Multimedia Database Management System

Unit 9. User Interface [3 Hrs.]
9.1. Basic Design Issues
9.2. Video and Audio at the User Interface
9.3. User- friendliness as the Primary Goal

Unit 10. Synchronization [4 Hrs.]
10.1. Notation of Synchronization
10.2. Presentation Requirements
10.3. Model for Multimedia Synchronization
10.4. Specification of Synchronization

Unit 11. Abstraction for programming [4 Hrs.]
11.1. Abstractions Levels
11.2. Libraries

11.3. System Software
11.4. Toolkits
11.5. Higher Programming Languages
11.6. Object –oriented approaches

Unit 12. Multimedia Application [3 Hrs.]

12.1. Program and Structure
12.2. Media Preparation
12.3. Media Composition
12.4. Media Integration
12.5. Media Communication
12.6. Media Consumption
12.7. Media Entertainment
12.8. Trends in multimedia applications

Practical: [30 Hrs.]

Lab exercises are as follows:

1. To edit various format of Images and give the various effects in images using Adobe Photoshop
2. Vector-based drawing application using Macromedia FreeHand
3. To create different types of animation, use the action script to control the various objects using Macromedia Flash and swish Max
4. To edit and publish the movie in various formats using Adobe Premiere
5. To integrate all the multimedia objects like audio, video, images etc and will able to create different interactive presentations using Macromedia Director

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Sound / Audio System	3	6
3	Images and Graphics	4	7
4	Video and Animation	4	7
5	Multimedia Applications Development	4	7
6	Data Compression	4	7
7	Designing Multimedia	4	7
8	Application Subsystem	4	7
9	User Interface	3	6
10	Synchronization	4	7
11	Abstraction for programming	4	7
12	Multimedia Application	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Multimedia: Computing, Communications and Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education Asia
2. Multimedia Communications, Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education Asia

3. Multimedia Systems, John F. Koegel Buford, Pearson Education Asia
4. Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, Tata MCGraw Hill

Internet of Things

EG3202CT

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course provides theoretical as well as practical knowledge of fundamentals of Internet of Things to make students capable of designing, implementing and managing the issues of IOT in their personal as well professional life.

Course objectives:

After completion of this course students will be able to:

1. Design and implement fundamentals of IoT.
2. Manage privacy and security issues related to IoT.

Course Contents:

Theory

Unit 1. Introduction **[6 Hrs.]**

1.1. Definition
1.2. History of IoT
1.3. IoT Architecture
1.4. IoT Frameworks
1.5. Benefits of IoT
1.6. Applications of IoT

Unit 2. Fundamental Mechanisms and Key Technologies **[8 Hrs.]**

2.1. Identification of IoT Objects and Services
2.2. Structural Aspects of the IoT
2.3. Environment Characteristics
2.4. Traffic Characteristics
2.5. Scalability
2.6. Interoperability
2.7. Security and Privacy
2.8. Open Architecture
2.9. Key IoT Technologies
2.10. Device Intelligence
2.11. Communication Capabilities
2.12. Mobility Support
2.13. Device Power
2.14. Sensor Technology
2.15. RFID Technology
2.16. Satellite Technology

Unit 3. IoT Protocols **[6 Hrs.]**

3.1. Protocol Standardization for IoT
3.2. Efforts
3.3. M2M and WSN Protocols
3.4. SCADA and RFID Protocols
3.5. Unified Data Standards – Protocols

3.6. IEEE 802.15.4
3.7. BACNet Protocol
3.8. Modbus
3.9. Zigbee Architecture
3.10. Network layer
3.11. LowPAN
3.12. CoAP
3.13. Security

Unit 4. IoT with RASPBERRY PI [9 Hrs.]

4.1. Building IOT with RASPERRY PI
4.2. IoT Systems
4.3. Logical Design using Python
4.4. IoT Physical Devices & Endpoints
4.5. IoT Devices
4.6. Building blocks
4.7. Raspberry Pi -Board
4.8. Linux on Raspberry Pi
4.9. Raspberry Pi Interfaces
4.10. Programming Raspberry Pi with Python

Unit 5. IoT Privacy, Security and Governance [6 Hrs.]

5.1. Vulnerabilities of IoT
5.2. Security requirements
5.3. Threat analysis
5.4. Use cases and misuse cases
5.5. IoT security tomography and layered attacker model
5.6. Identity establishment
5.7. Access control
5.8. Message integrity
5.9. Non-repudiation and availability
5.10. Security model for IoT

Unit 6. Real-world applications and case studies [10 Hrs.]

6.1. Real world design constraints and challenges
6.2. Applications and Asset management
6.3. Industrial automation
6.4. Smart Metering Advanced Metering Infrastructure
6.5. Smart grid
6.6. e-Health Body Area Networks
6.7. Commercial building automation
6.8. Smart cities - participatory sensing
6.9. Data Analytics for IoT
6.10. Software & Management Tools for IoT
6.11. Cloud Storage Models & Communication
6.12. APIs
6.13. Cloud for IoT
6.14. Amazon Web Services for IoT

Practical: [45 Hrs.]

1. To Implement the IoT Frameworks

2. To Implement Cloud Storage Models & Communication
3. Interfacing sensors to Raspberry
4. Interfacing Arduino to Bluetooth Module
5. Communicate between Arduino and Raspberry PI using any wireless medium
6. To Design an IOT based system

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Fundamental Mechanisms and Key Technologies	8	14
3	IoT Protocols	6	11
4	IoT with RASPBERRY PI	9	15
5	IoT Privacy, Security and Governance	6	11
6	Real-world applications and case studies	10	18
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011. 3.
4. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
5. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012
7. HakimaChaouchi, “ The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Willy Publications
8. Daniel Kellmereit, Daniel Obodovski, “The Silent Intelligence: The Internet of Things”,. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700. 4. Fang Zhaho, Leonidas Guibas, “Wireless Sensor Network: An information processing approach”, Elsevier, ISBN: 978-81-8147-642-5.

Information Security

EG3203CT

Year: III **Total: 5 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course is designed to introduce basics of Information Security in digital world. It deals with elementary cryptography, protection mechanisms against threats and ways to administer security tools.

Course objectives:

After completion of this course students will be able to:

1. Find information vulnerability and attacks.
2. Use encryption techniques.
3. Get knowledge of program security, network security and database security.

Course Contents:

Theory

Unit 1. Introduction **[2 Hrs.]**

- 1.1. Information System
- 1.2. Data and Information
- 1.3. Vulnerability and attacks
- 1.4. Security Goals
- 1.5. Security services and mechanisms

Unit 2. Cryptographic Techniques **[10 Hrs.]**

- 2.1. Conventional Cryptographic Techniques
  - 2.1.1. Conventional substitution and transposition ciphers
  - 2.1.2. One-time pad
  - 2.1.3. Block cipher and stream cipher
  - 2.1.4. Steganography
- 2.2. Symmetric and Asymmetric Cryptographic Techniques
  - 2.2.1. Rivest, Shamir, and Adleman (RSA)
  - 2.2.2. Data Encryption Standard (DES)
  - 2.2.3. Advanced Encryption Standard (AES)

Unit 3. Authentication and Digital Signatures **[4 Hrs.]**

- 3.1. Use of Cryptography for authentication
- 3.2. Secure Hash function
- 3.3. Key management-Kerberos

Unit 4. Application Security **[4 Hrs.]**

- 4.1. Types
- 4.2. Security in cloud
- 4.3. Mobile application security
- 4.4. Web application security

Unit 5. Program Security **[4 Hrs.]**

5.1. Non-malicious Program errors
  5.1.1. Buffer overflow
  5.1.2. Incomplete mediation
  5.1.3. Time-of-check to Time-of-use errors
5.2. Viruses
5.3. Trapdoors
5.4. Salami attack
5.5. Man-in-the-middle attacks
5.6. Covert channels

Unit 6. Security in Networks **[8 Hrs.]**

6.1. Threats in networks
6.2. Network Security Controls
  6.2.1. Architecture
  6.2.2. Encryption
  6.2.3. Content Integrity
  6.2.4. Strong Authentication
  6.2.5. Access Controls (Physical and Logical)
  6.2.6. Wireless Security
  6.2.7. Honeypots
  6.2.8. Traffic flow security
6.3. Firewalls
  6.3.1. Design and Types of Firewalls
  6.3.2. Personal Firewalls
  6.3.3. Intrusion Detection System (IDS) and its types
  6.3.4. Intrusion Protection System (IPS)
6.4. Email Security
  6.4.1. PGP
  6.4.2. S/MIME

Unit 7. Database Security **[5 Hrs.]**

7.1. Security requirements
7.2. Reliability and integrity
7.3. Sensitive data
7.4. Inference
7.5. Multilevel database
7.6. Proposals for multilevel security

Unit 8. Security Administration **[8 Hrs.]**

8.1. Security Planning
8.2. Risk Analysis
8.3. Organizational Security policies
8.4. Physical Security
8.5. Legal Privacy and Ethical Issues in Computer Security:
  8.5.1. Protecting Programs and data
  8.5.2. Information and the law
  8.5.3. Rights of Employees and Employers
  8.5.4. Software failures
  8.5.5. Computer Crime

8.5.6. Privacy
8.5.7. Ethical issues in Computer Security
8.5.8. Case studies of ethics

Practical: **[30 Hrs.]**

1. Implement Caesar Cipher.
2. Implement substitution cipher.
3. Implement different cryptographic algorithm (RSA, DES, AES)
4. Implement Firewall.
5. Implement Access control.
6. Implement Digital Signature.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	2	4
2	Cryptographic Techniques	10	18
3	Authentication and Digital Signatures	4	7
4	Application Security	4	7
5	Program Security	4	7
6	Security in Networks	8	14
7	Database Security	5	9
8	Administering Security	8	14
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education
2. Cryptography and Network Security Principles and Practice, Fourth or Fifth Edition, William Stallings, Pearson
3. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
4. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall.

Entrepreneurship Development

EG3201MG

Year: III **Total: 5 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: hours/week

Practical: 2 hours/week

Lab: hours/week

Course Description:

This course is designed to provide the knowledge and skills on formulating business plan and managing small business. The entire course deals with assessing, acquiring, and developing entrepreneurial attitude; skills and tools that are necessary to start and run a small enterprise.

Course Objectives:

After completion of this course students will be able to:

1. Explain the concept of business and entrepreneurship.
2. Explore entrepreneurial competencies.
3. Analyze business ideas and viability.
4. Formulate business plan with its integral components.
5. Manage small business.

Course Contents:

Theory

Unit 1. Introduction to Business & Entrepreneurship [9 Hrs.]

1.1. Overview of entrepreneur and entrepreneurship
1.2. Wage employment, self- employment and business
1.3. Synopsis of types and forms of enterprises
1.4. Attitudes, characteristics & skills required to be an entrepreneur
1.5. Myths about entrepreneurs
1.6. Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal

Unit 2. Exploring and Developing Entrepreneurial Competencies [9 Hrs.]

2.1. Assessing individual entrepreneurial inclination
2.2. Assessment of decision-making attitudes
2.3. Risk taking behavior and risk minimization
2.4. Creativity and innovation in business
2.5. Enterprise management competencies

Unit 3. Business identification and Selection [4 Hrs.]

3.1. Sources and method of finding business idea(s)
3.2. Selection of viable business ideas
3.3. Legal provisions for MSMEs in Nepal

Unit 4. Business plan Formulation [18 Hrs.]

4.1. Needs and importance of business plan
4.2. Marketing plan
  4.2.1. Description of product or service
  4.2.2. Targeted market and customers
  4.2.3. Location of business establishment
  4.2.4. Estimation of market demand

4.2.5. Competitors analysis
4.2.6. Estimation of market share
4.2.7. Measures for business promotion

4.3. Business operation plan
4.3.1. Process of product or service creation
4.3.2. Required fix assets
4.3.3. Level of capacity utilization
4.3.4. Depreciation & amortization
4.3.5. Estimation office overhead and utilities

4.4. Organizational and human resource plan
4.4.1. Legal status of business
4.4.2. Management structure
4.4.3. Required human resource and cost
4.4.4. Roles and responsibility of staff

4.5. Financial plan
4.5.1. Working capital estimation
4.5.2. Pre-operating expenses
4.5.3. Source of investment and financial costs
4.5.4. Per unit cost of service or product
4.5.5. Unit price and profit/loss estimation of first year

4.6. Business plan appraisal
4.6.1. Return on investment
4.6.2. Breakeven analysis
4.6.3. Risk factors

Unit 5. Small Business Management [5 Hrs.]

5.1. Concept of small business management
5.2. Market and marketing mix
5.3. Basic account keeping

Practical: [30 Hrs.]

Unit 1: Introduction to Business & Entrepreneurship [2 Hrs.]

1. Collect business information through interaction with successful entrepreneur

Unit 2: Exploring and Developing Entrepreneurial Competencies [2 Hrs.]

1. Generate innovative business ideas

Unit 3: Product or service Identification and Selection [2 Hrs.]

1. Analyze business ideas using SWOT method

Unit 4: Business Plan Formulation [22 Hrs.]

1. Prepare marketing plan
2. Prepare operation plan
3. Prepare organizational and human resource plan
4. Prepare financial plan
5. Appraise business plan
6. Prepare action plan for business startup

Unit 5: Small Business Management [2 Hrs.]

1. Prepare receipt and payment account
2. Perform costing and pricing of product and service

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***

1	Introduction to Business & Entrepreneurship	9	16
2	Exploring and Developing Entrepreneurial Competencies	9	16
3	Business identification and Selection	4	7
4	Business plan Formulation	18	32
5	Small Business Management	5	9
	Total	**45**	**80**

E-Governance
Elective II
EG3204CT.1

Year: III **Total: 7 hours /week**
Part: II **Lecture: 3 hours/week**
Tutorial: 1 hours/week
Practical: hours/week
Lab: 3 hours/week

Course description:
This course deals with the introduction, different models for e-Governance, concept of e-Governance, different types of on-line business systems, techniques and implementation for electronics payment system, and legal considerations in e-Governance

Course objectives:
After completion of this course students will be able to:
1. Introduce e-Governance.
2. Explain security issues of e-Governance.
3. Describe the legal and ethical issues of e-Governance/ cyber law.
4. Impart knowledge in management and government projects

Course Contents:

Theory

Unit 1. Introduction **[4 Hrs.]**
- 1.1. History of e-Governance development
- 1.2. How e-Governance works
- 1.3. Categories of e-Governance
- 1.4. Applications
- 1.5. Global trading environment & adoption of e-Governance
- 1.6. Difference between traditional Government and e-Governance
- 1.7. Advantages and disadvantages of e-Governance
- 1.8. Benefits of e-Government
- 1.9. E-Government life cycle
- 1.10. Online service delivery and electronic service delivery
- 1.11. Maturity and adoption model

Unit 2. Models of e-Governance **[4 Hrs.]**
- 2.1. Major challenges of G2G
- 2.2. e-Governance
- 2.3. Governance to Business(G2B)
- 2.4. Development of G2B Governance
- 2.5. Difference between G2Cand G2B e-Governance
- 2.6. G2C, G2E

Unit 3. e-Governance Infrastructure **[4 Hrs.]**
- 3.1. Applications architecture
- 3.2. Support systems
- 3.3. Data center
- 3.4. Government gateway
- 3.5. Open-source software and free software
- 3.6. Electronic Data Interchange (EDI):

3.6.1. Components of EDI
3.6.2. protocol
3.6.3. EDI standards
3.6.4. Data standards used in EDI
3.6.5. Electronic funds transfer

Unit 4. Mobile Governance [4 Hrs.]

4.1. Application of M-Governance
4.2. Advantage of m-Governance
4.3. Wireless application protocol
4.4. WAP Browser
4.5. Mobile Commerce architecture

Unit 5. Technology for Online business [3 Hrs.]

5.1. IT Infrastructure
5.2. Internet
5.3. Intranet
5.4. Extranet
5.5. VPN, Firewall
5.6. Cryptography
5.7. Digital signature
5.8. Digital certificate
5.9. Hypertext
5.10. Hypermedia
5.11. HTTP

Unit 6. Electronic payment system (EPS) [8 Hrs.]

6.1. Online banking
6.2. Types of EPS
6.3. Security requirement of EPS
6.4. Secure socket layer (SSL)
6.5. Secure electronic
6.6. Transaction (SET)
6.7. Payment gateway
6.8. Online payment processing
6.9. Payment processing Network

Unit 7. Security Issues in e-Governance [4 Hrs.]

7.1. e-Governance Security Issues
7.2. Risks Involved in e-Governance
7.3. e-Governance Security tools
7.4. Protecting e-Governance System
7.5. Biometric
7.6. Client server Network security
7.7. Data and message security

Unit 8. Legal and Ethical Issues [3 Hrs.]

8.1. Issues related to e-Governance
8.2. Legal issues
8.3. Ethical issues

8.4. Taxation

Unit 9. Cyber law **[3 Hrs.]**

9.1. Aims of cyber law
9.2. Salient provisions of cyber law
9.3. Contracting and contract enforcement

Unit 10. Managing and implementing e-Governance **[8 Hrs.]**

10.1. Management and strategy of e-Government systems
10.2. Managing public Data
10.3. Managing and emerging issues for e-Government
10.4. e-Government system life cycle and project assessment
10.5. Analysis of current reality
10.6. Design of new e-Government system
10.7. e-Government Risk assessment and mitigation
10.8. e-Government system construction
10.9. Implementation and beyond
10.10. Developing e-Government hybrids

Practical: **[45 Hrs.]**

Case studies on developed and developing countries on e -Governance development (G2C, G2B and G2G) and report submission.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	4	7
2	Models of e-Governance	4	7
3	Infrastructure use in e-Governance	4	7
4	Mobile Governance	4	7
5	Technology for Online business	3	5
6	Electronic payment system (EPS)	8	15
7	Security Issues in e-Governance	4	7
8	Legal and Ethical Issues	3	5
9	Cyber law	3	5
10	Managing and implementing e-Governance	8	15
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Richard Heeks, Implementing and managing e-Government
2. C.S. R Prabhu, e-Governance: Concepts and Case studies, prentice hall of India Pvt. Ltd.
3. J. Satyanarayana, e-Government, prentice hall of India Pvt. Ltd

Computer Simulation and Modeling

Elective II

EG3204CT.2

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course introduces the simulation and modeling approaches which includes the modeling of a system, its validation and verification, and the analysis of simulation output. It also covers the concept of random number generation and queuing theory as well as the study of some simulation language and tools.

Course objectives:

After completion of this course students will be able to:

1. Create a computer simulation of a set of observations based on the physical characteristics of the system.
2. Explore the knowledge to develop and execute their own simulation models of continuous, discrete-event and other simulation methods.
3. Review basic simulation methods and principles applied to the architecting and engineering of complex systems

Course Contents:

Theory

Unit 1. Introduction **[8 Hrs.]**

1.1. System, Model and Simulation
1.2. Continuous and Discrete Systems
1.3. Models of a system and its types
1.4. Simulation study Phases
1.5. Model Development life cycle
1.6. Areas of Application, Advantages and Disadvantages
1.7. Physical and Mathematical Models: Static and Dynamic

Unit 2. Simulation of Continuous and Discrete System **[8 Hrs.]**

2.1. Differential and Partial Differential equations
2.2. Continuous System Models
2.3. Analog Computer, Analog Methods, Hybrid Simulation
2.4. Digital-Analog Simulators
2.5. Feedback Systems

Unit 3. Queuing System **[8 Hrs.]**

3.1. Characteristics and Structure of Basic Queuing System
3.2. Models and Types of a Queuing System
3.3. Queuing notation
3.4. Measurement of Queuing System Performance
3.5. Applications of queuing system

Unit 4. Random Number **[8 Hrs.]**

4.1. Random Numbers and its properties

4.2. Pseudo Random Numbers
4.3. Methods of generation of Random Number
4.4. Tests for Randomness: Uniformity and independence
4.5. Generating discrete distribution
4.6. Inversion, rejection, composition and Convolution

Unit 5. Verification and Validation [6 Hrs.]

5.1. Design of Simulation Models
5.2. Verification of Simulation Models
5.3. Calibration and Validation of the models
5.4. Three-Step Approach for Validation of Simulation Models
5.5. Accreditation of Models

Unit 6. Computer system Simulation and output analysis [4 Hrs.]

6.1. Estimation methods
6.2. Simulation run statistics
6.3. Replication of runs
6.4. Elimination of initial bias
6.5. Simulation tools
6.6. System simulation
6.7. CPU and memory simulation

Unit 7. Software use in Simulation [3 Hrs.]

7.1. Continuous system simulation language (CSSL)
7.2. Simulation in java
7.3. Simulation using GPSS
7.4. Simulation using SSF

Practical [45 Hrs.]

Practical should include the simulation of some real time systems (continuous and discrete event systems), Queuing Systems, Random Number generations as well as study of Simulation Tools and Language (Break down)

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	8	14
2	Simulation of Continuous and Discrete System	8	14
3	Queuing System	8	14
4	Random Number	8	14
5	Verification and Validation	6	11
6	Computer system Simulation and output analysis	4	8
7	Software use in Simulation	3	5
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicole, "Discrete Event system

2. simulation", 5th Edition, Pearson Education A.M. Law and W.D. Kelton: Simulation and Modeling and analysis
3. R. Y. Rubinstein, B. Melamed: Modern Simulation and Modeling
4. S. Shakya: Lab Manual on Simulation and modeling

Artificial Intelligence

Elective II

EG3204CT.3

Year: III **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: 0 hours/week

Lab: 3 hours/week

Course description:

This course is designed to introduce basics of artificial intelligent. It covers fundamental concepts artificial intelligence, problem solving, knowledge representation, neural networks, machine learning, natural language processing, machine vision and expert systems.

Course objectives:

The objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Upon the completion students will be able to:

1. Gain fundamental concepts of principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
2. Investigate applications of AI techniques in expert systems, artificial neural networks and other machine learning models.

Course Contents:

Theory

Unit 1. Introduction [6 Hrs.]

1.1. Artificial Intelligence,
1.2. Hard vs. Strong AI, Soft vs. Weak AI
1.3. Foundations and Applications
1.4. Intelligent Agents:
  1.4.1. Introduction of agents
  1.4.2. Structure of Intelligent agent
  1.4.3. Properties of Intelligent Agents
  1.4.4. PEAS description of Agents
  1.4.5. Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based, Learning agent, Environment Types: Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent

Unit 2. Problem Solving Methods [12 Hrs.]

2.1. Definition of a Problem, Problem as a state space representation, Problem formulation, Well-defined problems
2.2. Constraint satisfaction problem
  2.2.1. Water jug problem
  2.2.2. N-Queen problem
  2.2.3. Cryptarithmetic problem
2.3. Problem solving by searching
2.4. Types of searching
2.5. Measuring problem solving performance
2.6. General State Space Search
2.7. Uninformed:
  2.7.1. Breadth-First Search

2.7.2. Depth-First Search
2.7.3. Depth-Limited Search
2.7.4. Iterative Deepening depth first Search.

2.8. Informed search:
2.8.1. Greedy Best-First Search
2.8.2. A* Search, Optimality of A*
2.8.3. Local search: Hill Climbing

2.9. Game Playing, Optimal Decisions in Games, Alpha – Beta Pruning, Minimax Algorithm, Tic-Tac –Toe Problem, Stochastic Games

Unit 3. Knowledge Representation and Reasoning [10 Hrs.]

3.1. Definition and importance of Knowledge
3.2. Issues in Knowledge Representation
3.3. Knowledge Representation Systems
3.4. Properties of Knowledge Representation Systems
3.5. Types of Knowledge
3.6. The Role of Knowledge
3.7. Knowledge representation techniques:
3.7.1. Rule Based
3.7.2. Logic based
3.8. Propositional Logic
3.8.1. Syntax and Semantic of propositional logic
3.8.2. Proof by Resolution
3.9. Predicate Logic:
3.9.1. FOPL, Syntax, Semantics, Quantification, horn clauses
3.9.2. Inference with FOPL: By converting into PL (Existential and universal instantiation)

Unit 4. Learning [5 Hrs.]

4.1. Concepts of machine learning
4.2. Rote learning
4.3. Learning by analogy
4.4. Inductive learning
4.5. Explanation based learning,
4.6. Supervised and unsupervised learning
4.7. Learning by evolution (genetic algorithm)

Unit 5. Neural Networks and Natural Language Processing [7 Hrs.]

5.1. Introduction to artificial neural network
5.2. Mathematical model of neural network
5.3. Types of neural network: feed-forward, feed-back, Gate realization using neural network
5.4. Learning in neural networks: Back propagation algorithm, Hopfield network
5.5. Concepts of natural language understanding and natural language generation
5.6. Steps in natural language processing:
5.6.1. Syntax analysis
5.6.2. Semantic analysis
5.6.3. Pragmatic analysis

Unit 6. Expert System and Machine Vision [5 Hrs.]

6.1. Expert System
6.2. Architecture of an expert system
6.3. Stages of expert systems development.
6.4. Concept of Machine Vision
6.5. Steps of machine vision
6.6. Application of machine vision

Practical **[45 Hrs.]**

Laboratory exercises can be conducted in PROLOG or any other high-level programming languages. Laboratory exercise must cover the concepts of:

1. Rule based intelligent agents
2. Inference and reasoning
3. Implementing DFS
4. Implementing BFS
5. Implementing A* search
6. Implementing Tic-Tac Toe
7. Implementing water jug problem
8. Implementing N-queen problem
9. Neural networks, etc. for solving practical problems.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	12
2	**Problem Solving Methods**	12	21
3	Knowledge Representation and Reasoning	12	21
4	Learning	4	7
5	Neural Networks and Natural Language Processing	7	12
6	Expert System and Machine Vision	4	7
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. R. Stuart and N. Peter, Artificial Intelligence A Modern Approach, Pearson
2. E. Rich, K. Knight, Shivashankar B. Nair, Artificial Intelligence, Tata McGraw Hill.
3. D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall

Major Project
EG3205CT

Year: III **Total: 8 hours /week**
Part: II **Lecture: … hours/week**
Tutorial: … hour/week
Practical: 8 hours/week
Lab: … hours/week

Course description:
The main aim of this course is to plan and complete project work, related with Computer Engineering under the supervision of an instructor or a supervisor.

Course objectives:
On completion of this course, the students will be able to:

1. Develop the ability to tackle individually a selected problem to a reasonable depth of understanding
2. Develop the ability to organize and produce a professional product using an engineering approach
3. Develop the ability to produce technical documentation to a high standard
4. Develop the ability to produce an analytical report which explains the work carried out by the students in the project and the final product they have developed

Project Overview:

1. Group formation (3-4 persons / group)
2. Project concept development
   a. Finding Project concept
   b. Scope of project
   c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

Description of the Project Work:
The work carried out must be a practical, problem-solving project. It should be a realistic project in the sense that the product should be useful practically as far as possible.

The project should:

- be intended to develop a Computer Engineering solution to a practical problem
- be carried out using an engineering approach
- emphasize design
- be carried out in a group (3-4 person/group)
- normally result in the production of a piece of software
- include technical documentation based on documentation guideline.
- be fully described from inception to completion in a written report produced to a good level of professional competence

Procedure:

1. A detailed project proposal to be submitted to the project supervisor for the approval of project work.
2. A mid-term progress report to be submitted to the supervisor. The supervisor must hold an oral presentation of about 10 minutes (including progress preview) to evaluate the mid-term progress of the project work.
3. A final written report will be submitted at the end of project work. There will be a final oral group presentation of about 15 minutes (including demonstration). The project coordinator, the supervisor and the external examiner nominated by the project coordinator will evaluate the submitted report as well as the presentation.

Requirements for report writing:

Font Name: Times New Roman
Top Margin: 1 inch
Left Margin: 1 inch
Right Margin: 1 inch
Bottom Margin: 1 inch
Gutter: 0.25 inch (left)
Header and Footer: 0.5 inch
Line Spacing: Single
Paragraph Spacing: 8 pt.
Font Size: 12 pt. (for normal text)
Follow following standard for headings

2. Heading1 (16pt, Bold)

2.1. Heading2 (14pt, Bold)

2.1.1. Heading3 (13pt, Bold)

2.1.1.1. Heading4 (12pt, Bold)

Arrangement of Contents in a report:

The sequence of contents in a major project report is as follows

1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary

- Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.

6. Table of Contents

- The table of contents should list all material following it as well as any material which precedes it.

7. List of Figures (if any)

- The list should use exactly the same captions as they appear below the figures in the text.

8. List of Tables (if any)

- The list should use exactly the same captions as they appear above the tables in the text.

9. List of Symbols (if any)

- The list should provide the detail of the symbols used in the report.

10. Abbreviations (if any)

- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.

11. Main body
    11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features,
    Feasibility, System Requirement)
    11.2. Chapter 2: Literature Review
    11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
    11.4. Chapter 4: Result and Analysis
    11.5. Chapter 5: Conclusion, Recommendation and Limitations
12. References
    - The reference should be in IEEE format.
13. Appendices (if any)

    - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

Page numbering: The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc.). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc. at the bottom.

Figure and Table numbering: It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually, the figure captions are written below the figure and table captions on top of the table.

Evaluation Scheme:
The project coordinator, the supervisor and the external examiner should evaluate the project work and presentation by the following criteria:

S.N.	Topic	Marks Distribution
1	Proposal Defense	20
2	Mid-term progress report/presentation	60
3	Final project report/presentation	120 (Project coordinator =10 supervisor =30 external examiner =80)
	Total	**200**

Detailed Evaluation Scheme

S.N.	Topic	Marks Distribution
1	Presentation skill	20%
2	Team work	10%
3	Understanding of project work and related theory	20%

4	Project demonstration	20%
5	Project Applications	10%
6	Documentation	20%
	Total	**100%**

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