CURRICULUM

DIPLOMA

Electronics Engineering

(Three year program-semester system)

Council for Technical Education and Vocational Training

Curriculum Development Division

Sanothimi, Bhaktapur

2008 (Revised in 2014)

Table of Contents

1. Introduction:

Electronics Engineering is one of the prominent and popular disciplines within engineering. Many people in the developed countries, developing countries and under developed countries have given emphasis for the broader application of electronics appliances. This field has been helping the world for the technicological development and it has been creating wage and self-employment opportunities both in public and private sectors. This curriculum is designed with the purpose of producing the middle level technical workforce equipped with knowledge and skills related to the field of electronics engineering so as to meet the demand of such workforce in the country to contribute in the national economic development of Nepal. The knowledge and skills incorporated in this curriculum will be helpful to deliver the individual needs as well national needs in the field of electronics engineering.

2. Curriculum title:

Diploma in Electronics Engineering (DEX)

3. Objectives:

This curriculum has following objectives:

3.1 To produce the middle level competent technical workforce/human resource (Technical and Supervisory staffs) in electronics engineering.

3.2. To prepare such technicians who are able to work in the industrial settings of the country.

3.3. To prepare such technical workforce who will demonstrate positive attitude and respect for the profession and socio-cultural values.

3.4. To help meet the demand of such technical workforce for the industries of Nepal.

3.5. To reduce the dependence on employing such technicians from foreign countries.

4. Program description:

This course is based on the job required to perform by an electronics technician at different related industries and organizations in Nepal. The diploma in electronics engineering program extends over three years. Each year is divided into two semesters. There are six semesters within the period of three years. This curriculum includes the core subjects like physics, chemistry, and mathematics applicable in the field of engineering. It also includes Nepali and English subjects for the communication. The course structure and the subject wise contents that reflect the details of the curriculum. In short, the aim of this curriculum is to produce competent and highly employable middle level technical workforce in the field of electronics engineering. The contents of individual subjects prescribed in the curriculum are incorporated in the light of "must to know and must to do" principle.

5. Duration:

The total duration of this program is three years. Each year consists of two semesters of six months. Moreover, one semester consists of 19.5 academic weeks including the evaluation period. Actual teaching learning hours will be not less than 15 weeks in each semester.

6. Target group:

The target group for this programme will be all interested individuals who passed School Leaving Certificate (SLC) with English, Science, and Mathematics or equivalent and related Technical School Leaving Certificate (TSLC).

7. Group size:

The group size is maximum 48 (Forty eight) in a batch.

8. Target location:

The target location is all over Nepal.

9. Entry criteria:

- SLC or equivalent with English, Science, and Mathematics or related TSLC
- Should pass the entrance examination.
- Physically fit for the program.

10. Selection:

Applicants fulfilling the entry criteria are selected for admission on the basis of merit.

11. Medium of instruction:

The medium of instruction is in English and/or Nepali.

12. Pattern of attendance:

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

13. Teacher and student ratio:

- For theory: As per the nature of the course.
- For practical / demonstration: 1:12
- For bench work: 1:8

14. Teachers and demonstrators:

- The disciplinary subject related teacher should be a bachelor's degree holder in the related area with three years experience in the related field.
- The demonstrators should be the bachelor's degree holder in the related area with two years experiences in training activities.
- The foundational subjects' related teachers (refer to course code SH and MG) should be master's degree holders in the related areas.

15. Mode of education:

There will be inductive and deductive mode of education.

16. Instructional media and materials:

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

- ***Printed Media Materials*** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packages, Procedure sheets, Performance Check lists, Textbooks etc.).
- ***Non-projected Media Materials*** (Display, Models, Flip chart, Poster, Writing board etc.).
- ***Projected Media Materials*** (Opaque projections, Overhead transparencies, Slides etc.).
- ***Audio-Visual Materials*** (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).
- ***Computer-Based Instructional Materials*** (Computer-based training, Interactive video etc.).

17. 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, Industries practice

18. Examination and marking scheme:

- The subject teacher will internally assess the students' achievement in each subject during the course followed by a final examination at the end of each semester.
- A weightage of 20% for the internal assessment and 80% for the semester final examination will be allocated for theoretical components of a subject.
- The final semester examinations of all theory components will be conducted through written tests.
- Generally the method of continuous assessment will be adopted for practical components.
- In some cases semester final examinations are also conducted for practical components as per the needs.
- The student who fails in the internal assessment will not be allowed to sit in the semester final examination and will also not allowed continuing the following semester study.

19. Provision of back paper:

There is a provision of back paper; however, students must pass all the subjects of all six semesters within six years from the date of enrolment.

20. Disciplinary and ethical requirements:

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

21. Pass marks:

The students must secure minimum 40% marks both in theory and practical (Lab). Moreover, the students must secure minimum 40% marks in the internal assessment and 40% in the final semester examination of each subject to pass all subjects offered in each semester.

22. Grading system:

The overall achievement of each student will be measured by a final aggregate percentage of all final semester examinations and graded as follow;

- Distinction : > or =80 %
- First division : 65 % to < 80 %
- Second division : 50 % to 65 %
- Pass : 40 % to < 50 %

23. Certification and degree awards:

- Students who have passed all the components of all subjects of all six semesters are considered to have successfully completed the course.
- Students who have successfully completed the course will be awarded with a degree of **Diploma in Electronics Engineering**.

24. Career path:

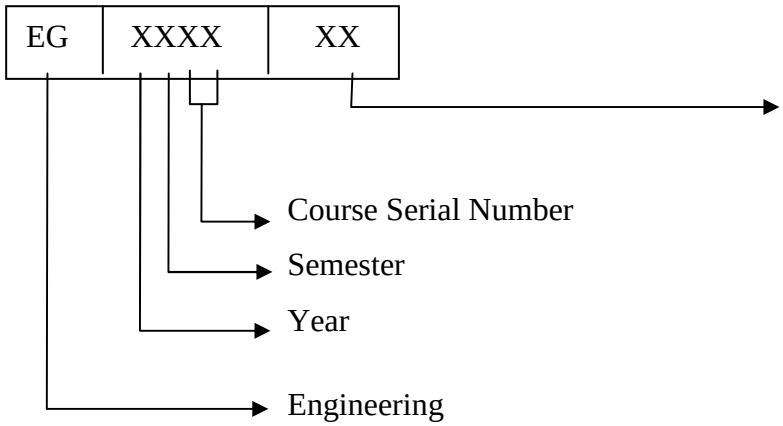
The graduates will be eligible for the position equivalent to non-gazetted 1st class (technical) as electronics technician or as prescribed by the public service commission of Nepal. The graduate will be eligible for registration with the related council in the grade as mentioned in the related council act (if any).

25. Curriculum and credits:

In this curriculum each subject has its code; full marks; and class hours divided into lecture hours, tutorial hours, and practical hours.

26. Subjects codes

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



Offering Departments:

AE: Automobile Engineering

AR: Architecture Engineering

CE: Civil Engineering

CT: Computer Engineering

EE: Electrical Engineering

EX: Electronics Engineering

ME: Mechanical Engineering

MG: Management

SH: Science and Humanities

27. Provision of elective subjects:

There will be a provision of two elective subjects in the final semester of this curriculum. Subjects of electronics engineering discipline such as Microcontroller and Applications, Optical Fibre Communication, Imaging Technology and Equipments, Control System & Renewable Energy Technology are offered here with the provision of the elective I and VLSI Design, Computer Organization and Architecture, Biomedical Instrumentation and Wireless and Mobile Communication are offered as elective II.

DIPLOMA IN ELECTRONICS ENGINEERING
Curriculum Structure

Year: I **Semester: I**

SN	Code No.	Subjects	Mode					DISTRIBUTION OF MARKS						Total Marks	Remark
								Theory			Practical				
			L	T	P	Lab	Total Hour	Asst. Marks	Final Marks	Time Hours	Asst. Marks	Mark Final	Time Hrs.		
1	EG1101SH	Communication Nepali	2				2	10	40	1.5				50	* Continuous Assessment
2	EG1102SH	Communication English	2				2	10	40	1.5				50	
3	EG1103SH	Engineering Mathematics I	4	1			5	20	80	3				100	
4	EG1104SH	Engineering Physics I	3	1		2	6	20	60	3	10	10	1.5	100	
5	EG1105SH	Engineering Chemistry I	3	1		2	6	20	60	3	10	10	1.5	100	
6	EG1106ME	Engineering Drawing I	1		3		4				60	40	4	100	
7	EG1112ME	Workshop Technology I	2		6		8	10	40	1.5	90	60	6	200	
8	EG1108 EE	Electrical Engineering I	4		3		7	20	80	3	30	20	3	150	
		Total =	**21**	**3**	**12**	**4**	**40**	**110**	**400**		**200**	**140**		**850**	

Year: I **Semester: II**

SN	Code No.	Subjects	Mode					DISTRIBUTION OF MARKS						Total Marks	Remark
								Theory			Practical				
			L	T	P	Lab	Total Hour	Asst. Marks	Final Marks	Time Hours	Asst. Marks	Mark Final	Time Hrs.		
1	EG 1201 SH	Engineering Mathematics II	3	1			4	20	80	3				100	* Continuous Assessment
2	EG 1202 SH	Engineering Physics II	3	1		2	6	20	60	3	10	10	1.5	100	
3	EG 1203 SH	Engineering Chemistry II	3	1		2	6	20	60	3	10	10	1.5	100	
4	EG1204 ME	Engineering Drawing II	1		3		4				60	40	4	100	
5	EG1205 ME	Workshop Technology II			4		4				60	40	4	100	
6	EG1206 EE	Electrical Engineering II	3		3		6	20	80	3	30	20	3	150	
7	EG 1207 CT	Introduction to Computers	2		2		4	10	40	1.5	30	20	3	100	
8	EG1208 EX	Electronics Devices and Circuits I	4		2		6	20	80	3	30	20	3	150	
		Total	**19**	**3**	**14**	**4**	**40**	**110**	**400**		**230**	**160**		**900**	

Year: II **Semester: I**

S.N	Code No.	Subjects	Mode			Total Hours	Distribution of Marks							Remarks
							Theory			Practical				
			L	T	P		Assessment Marks	Final Marks	Time Hours	Assessment Marks	Final Marks	Time Hours	Total Marks	
1	EG 2102 EX	Electronic Devices and Circuits II	5		3	8	20	80	3	30	20	3	150	* continuous assessment
2	EG 2103 EX	Electronics Drawing			2	2				30	20	3	50	
3	EG 2104 SH	Engineering Mathematics III	3	1		4	20	80	3				100	
4	EG 2104 EX	Digital Electronics I	4		3	7	20	80	3	30	20		150	
5	EG 2107 CT	Computer Programming and Applications	3		3	6	20	80	3	30	20	3	150	
6	EG 2107 EE	Electrical Installation			4	4				60	40	4	100	
7	EG 2108 EE	Network Filters & Transmission Lines	3		3	6	20	80	3	30	20	3	150	
8	EG 2109 EX	Electronics Components and Materials	3			3	20	80	3				100	
		Total	**21**	**1**	**18**	**40**	**120**	**480**		**210**	**140**		**950**	

Year II **Semester: II**

S.N	Code No.	Subjects	Mode			Total Hours	Distribution of Marks							Remarks
							Theory			Practical				
			L	T	P		Assessment Marks	Final Marks	Time Hours	Assessment Marks	Final Marks	Time Hours	Total Marks	
1	EG2201EX	Principle of Communication Engineering	4		3	7	20	80	3	30	20	3	150	* continuous assessment
2	EG2203EX	Introduction to Microprocessors	3		3	6	20	80	3	30	20	3	150	
3	EG2204EX	Electronic Instruments & Measurement	3		3	6	20	80	3	30	20	3	150	
4	EG2206EX	Digital Electronics II	3		3	6	20	80	3	30	20	3	150	
5	EG2207EX	Industrial Electronics	3		3	6	20	80	3	30	20	3	150	
6	EG2209EX	Instrumentation and PLC	3		3	6	20	80	3	30	20	3	150	
7	EG2210EX	Electronic Fabrication Techniques			3	3				30	20	3	50	
		Total	**19**		**21**	**40**	**120**	**480**		**210**	**140**		**950**	

Year III **Semester: I**

S.N	Code No.	Subjects	Mode			Total Hours	Distribution of Marks							Remarks
							Theory			Practical				
			L	T	P		Assessment Marks	Final Marks	Time Hours	Assessment Marks	Final Marks	Time Hours	Total Marks	
	EG3101EX	Communication System	4		3	7	20	80	3	30	20	3	150	* continuous assessment
2	EG3102EX	Microwave and Radar Engineering	4		3	7	20	80	3	30	20	3	150	
3	EG3103EX	Troubleshooting & Maintenance of Electronic Equipment			7	7				90	60	6	150	
4	EG3101CT	Computer Network	3		3	6	20	80	3	30	20	3	150	
5	EG3108EX	Consumer Electronics	4		3	7	20	80	3	30	20	3	150	
6	EG3101MG	Principle of Management and Costing	4			4	20	80	3				100	
		Total	**19**		**19**	**38**	**100**	**400**		**210**	**140**		**850**	

Year: III **Semester: II**

S.N	Code No.	Subjects	Mode			Total Hours	Distribution of Marks							Remarks
							Theory			Practical				
			L	T	P		Assessment Marks	Final Marks	Time Hours	Assessment Marks	Final Marks	Time Hours	Total Marks	
1	EG3202EX	Advanced Communication System	4		3	7	20	80	3	30	20	3	150	* continuous assessment
2	EG3203EX	Elective I (one of the followings)	4		3	7	20	80	3	30	20	3	150	
		Microcontroller and Applications												
		Optical Fibre Communication												
		Imaging Technology and Equipments												
		Control System												
		Renewable Energy Technology												
3	EG3204EX	Elective II (one of the followings)	4		3	7	20	80	3	30	20	3	150	
		VLSI Design												
		Computer Organization and Architecture												
		Biomedical Instrumentation												
		Wireless and Mobile Communication												
4	EG3205EX	Major Project			8	8				120	80	8	200	
5	EG3206EX	Medical Electronics	3		3	6	20	80	3	30	20	3	150	
6	EG3201MG	Entrepreneurship Development	3		2	5	20	60	3	10	10	1.5	100	
		Total	**18**		**22**	**40**	**100**	**380**		**250**	**170**		**900**	

First Year
(First and Second Semester)

First Semester

Subjects:

EG 1101 SH	Communication Nepali
EG 1102 SH	Communication English
EG 1103 SH	Engineering Mathematics I
EG 1104 SH	Engineering Physics I
EG 1105 SH	Engineering Chemistry I
EG 1106 ME	Engineering Drawing I
EG 1112 ME	Workshop Technology I
EG 1108 EE	Electrical Engineering I

कम्युनिकेसन नेपाली

ई.जी. ११०१ एस.एच.

वर्ष : प्रथम **जम्मा: २ घण्टा/ हप्ता**
सेमेष्टर : प्रथम **प्रवचन: २ घण्टा/ हप्ता**
पूर्णांक : ५०

कोर्षको परिचय

यस विषयमा विद्यार्थीहरूले भावी व्यवसायमा प्रभावकारी ढङ्गले सञ्चार गर्नका लागि आवश्यक पर्ने ज्ञान र सीपसँग सम्बन्धित नेपाली सञ्चारात्मक भाषा, लेखन सीप, र कृति परिचयको ढाँचा गरी जम्मा ३ वटा एकाईहरू सभावेश गरिएका छन् ।

कोर्षको उद्देश्य :

यस पाठ्यांशको अध्ययनबाट विद्यार्थीहरूले निम्नलिखित भाषिक क्षमता विकास गर्न सक्नेछन्:-

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

पाठचांशको विषयवस्तु

एकाइ १: संचारात्मक नेपाली भाषा **(७)**

१.१ भाषिक भेदको परिचय

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

१.२ दैनिक कार्यमा प्रयोग हुने भाषाको ज्ञान र प्रयोग

- अनुरोध तथा आदेश/निर्देशन गर्ने भाषाको ज्ञान र प्रयोग
- सोझै गरिने कामहरूमा प्रयोग हुने भाषाको ज्ञान र प्रयोग
- प्रश्नात्मक र वर्णनात्मक भाषाको ज्ञान र प्रयोग

एकाइ २: लेखन सीप **(१८)**

२.१ बोध, शब्दनिर्माण र शब्दभण्डारको ज्ञान र अभ्यास

क) शब्द भण्डार निर्माण र अभ्यास

- उपसर्ग
- प्रत्यय, (कृत् तथा तद्धित)
- समास
- प्राविधिक तथा पारिभाषिक शब्दहरूको ज्ञान र प्रयोग

ख) प्राविधिक/पारिभाषिक शब्दहरूको शब्दस्रोत,

- वर्णविन्यास (प्राविधिक शब्दका सन्दर्भमा आवश्यक मात्र)
- अर्थ र व्युत्पत्तिका लागि शब्दकोशको प्रयोगको अभ्यास

२.२ बुंदाटिपोट, सङ्क्षेपीकरण

- बुँदा लेखन
- सारांश लेखन

२.३ *अनुच्छेद* लेखन /प्रतिवेदन लेखन

२.४ निबन्ध लेखन

२.५ पत्र लेखन (निमन्त्रणा पत्र, सूचना, सम्पादकलाई चिठ्ठी र निवेदन आदि)

२.६ संवाद लेखन

एकाइ ३: कृति परिचय : निम्न लिखित ढाँचामा तलका कृतिको परिचय लेख्ने अभ्यास (५)

३.१ कृति परिचयको ढांचा :

- कृतिको नाम :
- कृतिकारको नाम :
- कृतिका मूल विषयवस्तु : (एक अनुच्छेद)
- कृतिको महत्व : (एक अनुच्छेद)
- कृतिले आफूलाई पारेको प्रभाव : (छोटो एक अनुच्छेद)
- कृतिको भाषा शैली : (छोटो एक अनुच्छेद)
- कृतिको कमी, कमजोरी र सुझाव : (छोटो एक अनुच्छेद)
- निष्कर्ष

३.२ कृतिहरू :

- सौर्य उर्जा
- ट्रेड कोर्श (कालिगढ तालिम) : एक परिचय : इ.अ.सं. पश्चिमाञ्चल क्याम्पस पोखरा ।
- भूकम्पबाट सुरक्षित रहन गर्नु पूर्व तयारी: भूकम्प प्रविधि राष्ट्रिय समाज नेपाल ।
- इन्जिनियरिङ नेपाली: लालानाथ सुवेदी ।
- सिंचाई प्रविधि ज्ञान : भोजराज रेग्मी, त्रि. वि. पाठ्यक्रम विकास केन्द्र

सिकाई सामग्रीहरू

- त्रि. वि. पाठ्यक्रम विकास केन्द्र, अनिवार्य नेपाली शिक्षण निर्देशन, काठमाण्डौं
- लालानाथ सुवेदी, इन्जिनीयरिङ नेपाली विद्यार्थी पुस्तक भण्डार, भोटाहिटी, काठमाण्डौं ।
- लालानाथ सुवेदी, नेपाली व्याकरण, बोध/रचना (सम्बन्धित अंश मात्र) विद्यार्थी पुस्तक भण्डार, भोटाहिटी, काठमाण्डौं ।
- गोरखापत्र, कान्तिपुर आदि पत्रिका सम्पादकीय, टिप्पणी र लेखहरू ।

- प्रशिक्षकहरूले आफ्नो पुस्तक तयार गर्न वा बजारमा पाइने सामग्री छानेर पढाउन सक्ने, तर परीक्षा महाशाखालाई यसको पूर्व जानकारी दिनुपर्ने

Communication English

EG 1102 SH

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

Course Description:

This subject consists of four units related to communicative English; writing skills in English; English sounds and structures; and English conversation practices so as to equip the students with the skills and knowledge of communication in English language in order to have an effective and efficient job performance through occupational communication in the workplace.

Course Objectives:

After the completion of this subject, students will be able to:
1. Familiarize with English sound and basic structures.
2. Communicate in English language at work/job environment
3. Define and use trade related technical terminologies
4. Demonstrate situational/structural conversation essential for job performance
5. Demonstrate various writing skills

Course Contents:

Unit 1. English sound and basic structures: [2]

1.1. Define with examples:
- Phonemes
- Morphemes

1.2. Introduction to English sounds with examples: [2]
- The Vowels
- The Consonants

1.3. Dictionary skills [3]
- Alphabetical order
- Dictionary entry
- Guide words, head words

1.4. Spellings [1]
- British and American English spelling

Unit 2. Introduction to grammatical units with examples:

2.1 Grammatical units [2]
- The word
- The phrase
- The clause
- The sentence

2.2 Types of sentence [2]
- Forms
- Function

2.3 Communicative functions [4]
- Introducing
- Requests and offers
- Expressing gratuities
- Expressing likes/dislikes
- Asking for permission
- Agreeing/disagreeing
- Encouraging/discouraging
- Inviting/making invites
- Accepting/decling
- Suggesting/advising
- Making and receiving telephone calls
- Group discussing and presentation

Unit 3. Reading: [2]
- Reading comprehension
- Defining trade related terminologies

Unit 4. Writing skills in English: [12]

4.1. Writing paragraphs
4.2. Writing dialogues
4.3. Writing precies/summaries
4.4. Writing letters
- Job application with resumes
- Leave application
- Business letters
- Orders
- Complains

4.5. Writing essays
4.6. Writing technical reports
4.7. Writing meeting minutes
4.8. Writing notices
4.9. Writing notices
4.10. Writing instructions
4.11. Writing technical proposal

Learning materials:

1. Poudel, R.C., A Manual to Communicative English, K.P. Pustak Bhandar, Kathmandu, 1956/57.
2. Shah, B.L.,A text book of writing skills in English, First edition Hira Books Enterprises, Kathmandu,
3. Fruehling, R. T. and Oldham N. B., Write to the point, McGraw- Hill, Inc. New York NY 10020
4. Tayior, G., English conversation practice, 1975.
5. Maharjan L. B., A textbook of English sounds and Structures, Vidyarthi Pustak Bhandar, Kathmandu, 2000.
6. Todd, LAN introduction to Linguistics, Longman York press, 1991.
7. Blundell, Jon, Higgens, Jonathan & Middlemiss, Nigel, Function of English, Oxford University Press
8. Naterop, Jean, Reuell, Rod, Telephoning in English, Cambridge Universuty Press,
9. ……., Better English Pronounciation, Cambridge University Press, New edition
10. …….. Link English, Central Department of English, Tribhuvan University
11. 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.
12. 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 Mathematics I

EG 1103 SH

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

Course Description:

This subject consists of four units related to trigonometry; coordinate geometry; algebra; and calculus necessary to develop mathematical background helpful for the understanding and practicing the related engineering works.

Course Objectives:

After the completion of this course, students will be able to explain the concepts of the followings and apply them in the field of related engineering area

1. Trigonometric ratios and equations, inverse circular functions and properties of triangles
2. Straight lines, angle between lines, circle and parabola
3. The progressions, permutations and combinations, binomial theorem, exponential and logarithmic series as well as the quadratic and polygonal equations
4. Sets, limit and continuity, derivatives, integration and integrals.

Course Contents:

Unit 1. Trigonometry: [12]

1.1. Review of trigonometric ratios:
- Basic trigonometric formulae
- Identities and conditional identities.

1.2. Trigonometric equations:
- Periodicity of trigonometric functions
- General solutions of the following equations:
  - Sin x = k , cos x = k and Tan x = k and using trigonometric equations.

1.3. Inverse circular functions:
- Domain and their graphs
- Formulae involving inverse circular functions
- Simple identities and equations involving circular functions

1.4. Properties of triangles:
- The sin law
- The cosine law
- The projection law
- The half angle formulae
- The area of a triangle
- The encircles and ex-circles of a triangle

Coordinate Geometry: [12]

2.1 Straight lines:

- The three standard forms of equations of a line.
- The linear equation: $ax + by + c = 0$.
- Any line through the intersection of two lines.
- Concurrency of lines.

2.2 Pair of straight lines:

- Angle between two lines
- Bisectors of angles between two lines
- Pair of lines
- Homogeneous equation of second degree
- General equation of second degree representing two lines
- Angle between a pair of lines
- Bisectors of the angles for a line pair
- Lines joining the origin to the points of intersection of a curve and a line

2.3. Circle:

- Standard equation
- General form
- Tangents and normal

2.4. Parabola:

- Standard equation
- Tangents and normal

Unit 2. Algebra: [12]

3.1. Progressions:

- A.P., G.P. and H.P.

3.2. Permutations and combinations

3.3. The binomial theorem for any index

3.4. Series:

- Exponential & logarithmic

3.4. Equations:

- Quadratic & polynomial

Unit 3. Set relation and function: [8]

4.1 Idea of set, set notations, set operations,

4.2. Venn diagram,

4.3. The set of real members and its subsets.

4.4. The absolute value of a real number.

4.5. Functions- algebraic and transcendental.

4.6. Graphs of simple function.

Unit 4. Calculus: [16]

5.1. Limit of community.

5.2. Derivatives from definition of simple functions like:

- x^n, $(ax+b)^n$, $\sin(ax+b)$, e^{ax}, a^x, and $\log x$.

5.3. Derivatives of sum, difference, product and quotient of functions, chain rule, parametric and implicit functions

5.4. Integration, Rules for finding integrals.
5.5. Standard integrals and their uses.
5.6. Definite integrals- definition and evaluation.
5.7. Definite integral as limit of sum.

Learning materials:

1. A Textbook on Engineering mathematics (for Diploma Engineering) part I, Bhim Prasad kafle, Makalu Publicartion House, Dillibazar, Kathmandu
2. A Text book of Statistics – B.C. Bajracharya
3. Elementary Statistics – H. C. Saxena
4. Statistical Methods – Mrigendralal Singh
5. Engineering Mathematics I, Hari Nandan Nath, Parishowar Acharya, Vudhyarthi Publisher and distributors, Bhotahity, Kathmandu
6. 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.
7. 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 Physics I

EG 1104 SH

Total: 6 hour /week
Year: I **Lecture: 3 hours/week**
Semester: I **Tutorial: 1 hours/week**
Practical: hours/week
Lab: 2 hours/week

Course Description:

This subject consists of four units related to mechanics, heat and thermodynamics, optics, and magnetism necessary to develop background in physics that supports for the understanding and practicing the related engineering works.

Course Objectives:

After the completion of this course, students will be able to explain the basic concepts related to the followings and apply them in the field of the related engineering area.

1. Mechanics.
2. Heat and thermodynamics.
3. Optics.
4. Magnetism.

Course Contents:

a. Mechanics: [15]

1.1 Basic units and measurements:
- Measurement of physical quantities
- Introductory ideas abut dimensions of physical quantities.
- Scalar and Vector: definitions and examples, dot and cross product of two vectors
- Composition and resolution of vectors (Triangle law and parallelogram law of vectors)

1.2 Newton's laws of motion:
- Newton's laws of motion (First, second and third laws)
- Principle of conservation of linear momentum
- Solid friction: Dynamic and rolling friction, laws of solid friction and its verification

1.3. Uniform circular motion:
- Angular displacement and velocity.
- Centripetal force and acceleration.
- Motion of bicycle rider

1.4. Gravitation:
- Newton's law of universal gravitation.
- Gravitational attraction of earth:

- Acceleration due to gravity.
- Variation of acceleration due to gravity with height, depth, and latitude.
- Motion of satellites:
  - Orbital velocity,
  - Geostationary satellites.
- Weightlessness, motion of lift

1.5. Work, energy, and power:
- Definition and units of work, energy and power.
- Potential and kinetic energy.
- Conservation of energy.
- Conservative forces.

1.6. Simple harmonic motion (SHM):
- Simple harmonic motion and its characteristics.
- Energy of simple harmonic motion.
- Simple pendulum.

1.7. Equilibrium and rotation of rigid bodies:
- Forces in equilibrium, torque, couple, C.G. and center of mass.
- Moment of inertia.
- Angular momentum and
- Its conservation.
- Work done by torque.

b. Heat and thermodynamics: [12]

2.1 Heat Phenomena and Quantity of Heat:
- Concept of temperature and thermal equilibrium.
- Temperature of scales.
- Quantity of heat gain or heat loss.
- Specific heat capacity.
- Determination of heat capacity by the method of mixtures.
- Newton's law of cooling.

2.2 Change of Phase:
- States of matter.
- Fusion and vaporization.
- Evaporation and boiling.
- Specific latent heats of fusion and vaporization.
- Melting and boiling points.
- Introduction of Saturated and unsaturated vapors.
- Variation of melting and boiling points with pressure.
- Triple point and critical point.
- Dew point and humidity.

2.3 Thermal Expansion:
- Coefficients of linear, superficial and cubical expansions of solid and relation between them.
- Cubical expansion of liquids.
- Real and apparent expansions.

- Variation of density due to expansion.

2.4 Heat Transfer:

- Thermal conduction and thermal conductivity
- Convection
- Radiation.
- Perfectly black body.
- Stefan-Boltzman's law of black body radiation.

2.5 Gas Laws:

- Boyle's law,
- Charles law and ideal gas equation.
- Universal gas constant,
- Avogadro number and Boltzman constant.
- Volume and pressure coefficients of ideal gas.

2.6 Kinetic Theory of Gases:

- Pressure in an ideal gas from molecular point of view.
- RMS speed, mean energy of a molecule of an ideal gas.

2.7 Thermodynamics:

- First law of thermodynamics.
- Different thermodynamic process:
  - Adiabatic (equation and work done)
  - isothermal (equation and work done)
  - Isobaric and Isochoric
- Specific and molar heat capacities for different thermodynamic processes, Cp-Cv =R.
- Second law of thermodynamics.
- Efficiency of heat engine

c. Optics: [8]

3.1 Reflection by plane surfaces

- Nature of light, sources of light
- Review of reflection by plane surfaces
- Deviation due to reflection
  - Deviation of light due to plane mirror
  - Deviation of light due to rotating mirror

3.2 Refraction by plane Surfaces:

- Review of refraction by plane surfaces.
- Lateral shift
- Total internal reflection, critical angle
- Real and apparent depth.

3.3 Reflection by Spherical Surfaces:

- Review of reflection by spherical surfaces.
- Construction of image by ray diagrams and nature of images
- Real and virtual images.
- Nature of images formed by spherical mirrors.
- Mirror formula for concave and convex mirror

3.4 Refraction through Prisms and Lenses:

- Deviation due to prism and minimum deviation.
- Refraction through lenses.
- Lens maker equation.
- Lens formula for converging lens, diverging lens
- Formation of images by lenses.
- Combination of lenses.
- Magnification,
- Power of a lens.

d. Magnetism: [10]

4.1 Magnets and Magnetic fields:

- Magnetic poles, magnetic moment, magnetic axis, and magnetic meridian.
- Magnetic field.
- Coulomb's law for magnetism.
- Magnetic field due to magnetic poles and bar magnets.
- Intensity and flux density of magnetic field.
- Neutral point.
- Tangent law.

4.2. Earth's Magnetism:

- Horizontal and vertical components of earth's magnetic field.
- Declination and angle of dip.

4.3. Magnetic properties of materials;

- Molecular and modern theory of magnetism.
- Para magnetism and diamagnetism:
  - Permeability and
  - Susceptibility.
- Intensity of magnetization.
- Domain theory of ferromagnetism.
- Hysterisis

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

1. Determine volume of hallow cylinder by using vernier calipers.
2. Determine density of a steel / glass ball by using screw gauge.
3. Determine thickness of glass plate using spherometer and calculate the area by using millimeter graph paper.
4. Determine the acceleration due to gravity by using simple pendulum.
5. Determine the magnetic movement of a bar magnet by using deflection magnetometer.
6. Determine the refractive index of the material of prism.
7. Determine specific heat capacity of solid by the method of mixtures.
8. Determine specific latent heat of ice by the method of mixtures.
9. Determine specific gravity of different solids by up thrust method.
10. Determine focal length of a converging lens by displacement method.

Learning materials:

1. Advanced level physics by Nelkon and Parker
2. A textbook of physics, part I and part II by Gupta and Pradhan
3. Numerical problems in Engineering Physics for Diploma in Engineering I & II, Pankaj Sharma Ghimire & Krishna Shrestha, S.K. Books, Dhapasi, Kathmandu
4. Engineering Physics I, Diploma in Engineering (first Year, First part) by Dhan Prasad Poudyal, Khemnath Poudyal, Suresh Prasad Gupta, Binaya Devkota, Laxmi Pustak Bhandar
5. Physics Practical Guide by U.P. Shrestha, RPB

Other learning materials:

1. 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 Chemistry I

EG 1105 SH

Total: 6 hour /week

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

Semester: I **Tutorial: 1 hours/week**

Practical: hours/week

Lab: 2 hours/week

Course Description:

This subject consists of three units related to general chemistry, language of chemistry, and system of classification necessary to develop background in chemistry that supports for the understanding and practicing related engineering works.

Course Objectives:

After the completion of this subject, students will be able to explain the basic concepts related to the followings and apply them in the field of related engineering works:

1. General chemistry
2. Language of chemistry
3. System of classification

Course Content:

Unit: 1: Language of chemistry: [4]

1.1 Symbol:
- Definition
- Significance (qualitative and quantitative)

1.2 Formula:
- Definition
- Significance (qualitative and quantitative)
- Concept of valency in terms of combining capacity with H_2, O_2, and Cl_2
- Variable valency (ref. Fe, Sn, Pb, Cu, Hg, S and N)
- Radicals (electro- positive and electro - negative)
- Writing a formula

1.3 Chemical equation:
- Definition
- Types requisites
- Significance and limitation
- Balancing of chemical equation by hit and trial method and Partial equation method

Unit: 2: General chemistry: [8]

2.1 Atom and molecule:
- Definition
- Dalton's atomic theory and modern position of the theory

2.2 Atomic weight:

- Definition
- Determination of atomic weight by Dulong and Petit's method and Related numerical problems

2.3 Molecular Weight:

- Definition
- Avogadro's hypothesis
- Application of Avogadro's hypotheses (Mol. Wt=2×V.D., in the deduction of atomicity of elementary gases H_2 , Cl_2, O_2, and N_2)
- Molecular weight determination by Victor Meyer's method and Related numerical problems

2.4 Equivalent weight:

- Definition
- Equivalent weight of element, acid, base and salt
- Equivalent weight determination by hydrogen displacement method and oxide method.
- Numerical relation between equivalent weight, atomic weight and valency
- Some related problems of equivalent wt. (From Hydrogen displacement method and oxide method)

2.5 Simple mole concept:

- Mole of an atom
- Mole of a molecule
- Molar volume and
- Simple calculation on mole concept

Unit: 3: System of classification: [33]

3.1 Acid, Base and Salt:

- Arrhenius concept of acid and base
- Lowry and Bronsted concept of acid and base
- Conjugate acid and base
- Amphoteric nature of water
- Lewis concept of acid and base
- Properties of acid and base.
- Definition of Salt
- Types of salt (normal, acidic and basic)
- Concept of hydrogen ion concentration, pH value and pH Scale
- Buffer solution.

3.2 Volumetric analysis:

- Definition of titration (acidimetry and alkalimetry),
- Indicator
- End-point (neutralization point)
- Standard solution (primary and secondary standard solution), Normal, Decinormal, Molar, Molal solution
- Requisites of primary standard substance

- Volumetric equation,
- Express the strength of solution Normality, Molarity, Molality, gram per litre and percentage and related numerical problems

3.3 Periodic table:

- Mendeleef's periodic law
- Mendeleef's periodic table
- Characteristics of groups and periods in the table
- Advantages and anomalies of the periodic table
- Modern periodic law

3.4 Electronic theory valency:

- Assumptions
- Types
- Electrovalency eg. NaCl, MgO, CaS
- Covalency eg. H_2, O_2, N_2, CH_4, H_2O, NH_3, C_2H_2
- Coordinate co-valency eg.H_2O_2, SO_2, O_3, SO_3)
- Electronic dot structure of some compounds eg.H_2SO_4, $CaCO_3$, K_2SO_3

3.5 Electrolysis:

- Definition of electrolyte, non-electrolyte and electrolysis
- Faraday laws of electrolysis,
- Application of electrolysis (electroplating and electro refining)
- Electrolysis of acidulated water

3.6 Oxidation and reduction:

- Classical definition
- Electronic interpretation
- Oxidizing agent: Definition and eg O_2, O_3, oxyacids, halogens, $K_2Cr_2O_7$, $KMnO_4$
- Reducing agent: Definition and eg. H_2, H_2S with some examples,
- auto-oxidation eg.H_2O_2, HNO_2, SO_2
- Idea of oxidation number
- Balancing chemical equation by oxidation number method

3.7 Atomic structure:

- Subatomic particles (electron, proton and neutron)
- Classical α - rays scattering experiment
- Rutherford's atomic model and its drawbacks
- Bohr's atomic model (postulates only)
- Composition of nucleus
- Mass number and atomic number
- Isotopes and isobar
- Arrangement of electron (Bohr - Bury Scheme)
- Concept of shell and sub shell,
- Electronic Configuration and atomic structure of Some elements (Atomic no. 1 to 30)
- Hund's rule
- General idea of quantum number and Pauli's exclusion principle

3.8 Corrosion:

- Definition
- Types
- Direct and indirect method and prevention against corrosion

3.9 Activity and electrochemical series:

- Definition
- Action of water, acid and oxygen on metals.

Engineering Chemistry Practical I **[30]**

1. Simple Glass Working [6]
   a. to cut the glass tube into three equal parts and round up their shape edges
   b. to bore a hole through a cork
   c. to bend the glass tubing into acute, obtuse and right angle
   d. to draw a jet and capillary tube
   e. to fit up a wash bottle
2. To separate sand and copper sulphate crystals in pure and dry state from the mixture of sand and copper sulphate [2]
3. To separate sand and calcium carbonate in pure and dry state from the mixture of sand and calcium carbonate [2]
4. To prepare pure water from supplied impure water by distillation and o test the purity of the sample prepared [2]
5. To neutralize dilute sulphuric acid with sodium carbonate solution, and to recover crystals of sodium sulphate [2]
6. To obtain pure and dry precipitate of barium sulphate by treating excess of dilute sulphuric acid with barium chloride solution [2]
7. To investigate the composition of water by electrolysis by using Hofmann's apparatus [2]
8. To determine the equivalent weight of reactive metal by hydrogen displacement method. [2]
9. To determine the pH of different unknown solution and using pH paper and universal indicator [2]
10. To prepare primary standard solution of sodium carbonate and to use it to standardize an approximate decinormal acid solution [2]
11. To standardize given unknown acid (Approx N/10) solution by preparing standard alkali solution. (Expression of strength in different ways) [2]
12. To standardize given unknown alkali (approximately N/10) solution with the help of by preparing standard acid solution. (Expression of strength in different ways) [2]
13. To carry out conductivity experiments on solids and liquids (CuSO4, Zn, Mg, Al, Fe, CCl_4, C_6H_6, C_2H_5OH) [2]

Text books:

1. A Text book of Chemistry, Jha and Guglani
2. Foundations of Chemistry, Vol. 1, M.K. Sthpit and R.R. Pradhananga

Reference books:

1. Fundamentals of Chemistry, K.R. Palak
2. Inorganic Chemistry, Bahl and Tuli
3. A Text book of Engineering Chemistry, R.S. Sharma
4. A Textbook of Inorganic Chemistry, L.M. Mitra
5. Elementary practical chemistry, M.K Sthapit
6. Engineering Chemistry, M.L. Sharma, K. M. Shrestha, PN, Choudhary
7. A Textbook of Engineering Chemistry, Prakash Poudel

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. **Note:** 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

EG1106ME

Total: 4 hours/week
Year: I **Lecture: 1 hours/week**
Semester: I **Tutorial: hours/week**
Practical: 3 hours/week
Lab: hours/week

Course Description:

This course deals with geometrical construction, orthographic projections and basic techniques of freehand sketch.

Course Objectives:

After completing this course the students will be able to

1. represent different shapes accurately by applying geometrical constructions,
2. project point, line, plane and geometrical solids,
3. represent three dimensional objects in orthographic from and dimension them,
4. use freehand techniques to sketch different shapes.

Course content:

Unit 1: Introduction [4]

1.1 Engineering drawing as graphic language
1.2 Drawing instruments
1.3 Scale: Reduced scale, enlarged scale, full size scale
1.4 Conventional line types
1.5 Sheet size and sheet layout
1.6 Exercise on drawing horizontal, vertical and inclined lines and conventional line types [*Sheet 1*]

Unit 2: Technical Lettering [4]

2.1 General procedure for freehand technical lettering: letter stroke, letter proportion, use of pencil and pens, uniformity of letters
2.2 Single stroke vertical capital letters, Single stroke inclined capital letters, Single stroke vertical lowercase letters, Single stroke inclined lowercase letters, vertical and inclined numerals, vertical and inclined fractions
2.3 Lettering using templates
2.4 Exercise on freehand technical lettering and lettering using templates [Sheet 2]

Unit 3: Geometrical Construction [12]

3.1 Construction on straight lines and angles

Bisection and trisection of a straight line, Bisection and trisection of an angle, To draw perpendicular lines, To draw parallel lines, To divide a straight line into any number of equal parts, To divide a straight line proportionately, To draw an angle equal to given angle

3.2 Construction of polygons

To draw triangles, To inscribe a circle of a triangle and circumscribe a circle about a given circle, To draw squares, To draw a regular polygon, To draw a regular hexagon, To draw a regular octagon, To draw a regular polygon (general method)

3.3 Exercise on construction on straight lines and angles and construction of polygons [*Sheet 3*]

3.4 Construction on circular arcs and circles

To determine center of a given arc, To draw a circle passing through three given points, To draw an arc tangent to given two straight lines, To draw an arc tangent to given straight line and a given circle or circular arc, To draw an arc tangent to given two circles or circular arcs, To draw open belt and cross belt tangents, To draw an ogee curve between two parallel lines

3.5 Exercise on construction on circular arcs and circles [Sheet 4]

3.6 Construction of standard curves

Construction of parabola, ellipse, hyperbola, cycloid, helix, spiral, involute

3.7 Exercise on construction of standard curves [Sheet 5]

Unit 4: Dimensioning [4]

4.1 Dimensioning terms and notations

4.2 Techniques of dimensioning: Size and location dimensioning

4.3 Placement of dimensions: Aligned and Unidirectional system

4.4 Rules for dimensioning and conventions

4.5 Exercise on dimensioning of two dimensional figures including straight line, angles, circles, circular arcs [Sheet 6]

Unit 5: Projection of Points, Lines and Planes [8]

5.1 Principle of projection

5.2 Principle planes of projections, four quadrants

5.3 Projection of point

Projection of point on two planes of projection, Projection of point on three planes of projection

5.4 Projection of line

Projection of line perpendicular to VP, Projection of line perpendicular to HP, Projection of line parallel to both VP and HP, Projection of line parallel to VP and inclined to HP, Projection of line parallel to HP and inclined to VP, Projection of line inclined to both VP and HP

5.5 Exercise on projection of point and line [Sheet 7]

5.6 Projection of plane

Projection of plane parallel to VP, Projection of plane parallel to HP, Projection of plane perpendicular to both VP and HP, Projection of plane perpendicular to VP and inclined to HP, Projection of plane perpendicular to HP and inclined to VP

5.7 True Length of an Oblique Line

5.8 True shape of an Oblique Plane

5.9 Exercise on projection of plane; true length of an oblique line; true shape of an oblique plane [Sheet 8]

Unit 6: Projection of Geometrical Solids [4]

6.1 Types of Solids: Polyhedra and Solids of revolution

6.2 Projection of geometrical solids: Prism, Cylinder, Pyramid and Cone

6.3 Projection of points on the surfaces solids

6.4 Exercise on projection of cylinder, prism, cone and pyramid; Projection of points on the surfaces of these solids [Sheet 9]

Unit 7: Orthographic Projection [20]

7.1 Principle of Orthographic Projection

7.2 Systems of Orthographic Projection: First Angle and Third Angle

7.3 Making an Orthographic Drawing

7.4 Analysis in Three Views

7.5 Exercise on orthographic projection of rectangular objects with horizontal and vertical plane surfaces [Sheet 10]

Exercise on orthographic projection of rectangular objects with inclined plane surfaces [Sheet 11]

Exercise on orthographic projection of objects with cylindrical surfaces [Sheet 12 &13]

Exercise on orthographic projection and dimensioning [Sheet 14]

Unit 8 Freehand Sketching [4]

8.1 Techniques of Sketching: Pencil hardness, paper with grid or lines
8.2 Techniques for horizontal and vertical lines; arcs and circles
8.3 Exercise on freehand sketches of different shapes with lines, arcs, and circles [Sheet 15]

References:

1. Luzadder, W.J., Fundamental of Engineering Drawing, Prentice-Hall of India Pvt-Ltd., New Delhi, Latest edition.
2. Bhatt N. D. and Panchal V.M., Engineering Drawing, Charotar Publishing House, 2001.
3. Gill P.S, Engineering Drawing, S. K. Kataraia & Sons, New Delhi, 2004/2005

Workshop Technology I

EG 1112ME

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

Course description:
This subject deals with the identification, uses and care of basic hand tools, measuring instrument, power tools, and apply safety precautions in mechanical and wood work.

Course Objectives:
After the completing this course the students will be able to:
1. Apply the safety rules in the workshop.
2. Identify the tools measuring instrument, power tools.
3. Operate the hand tools, power tools for the marking, measuring and cutting the metal in shape.
4. Joining the metal by different processes by hand.
5. Maintenance and care of the measuring instrument, hand tools and power tools.
6. Prepare different project of metal and wood.

Course Contents:

Unit 1: Safety in the workshop [1]

1.1: Workshop rules.
- Define safety.
- Use personal protective equipment.
- Apply workshop safety.
- Apply machine safety.

Unit 2: Laying Tools [2]

2.1: Layout tools
- Identify the scriber, punch, divider, surface plate, v-block and vernier height gauge.
- Use the tools for the line and point on the surface.
- Care and maintain the layout tools,

2.2: Hammer \hammering
- Identify the ball, cross, straight, claws and soft hammers.
- Select appropriate hammers for different work.
- Care and maintain the hammer

2.3: Wrenches
- Identify the single, double, pipe and the adjustable wrenches.
- Select appropriate wrenches for different work.
- Apply appropriate procedure of tightening and opening the elements.

2.4: Work holding device
- Identify the bench, machine, pipe and chain vices.
- Select suitable device according to use uses.

- Apply safety in vices, protect voice jaws and work pieces.

Unit 3: Cutting tools [10]

3.1: Chisels
- Identify the cross, diamond and round chisels.
- Select appropriate chisels while removing metal from the surface.
- Apply suitable holding techniques for chisel and chipping processes.
- Uses the chipping guard, care and maintain the chisel.

3.2: Hand saw and sawing
- Select the hand saw, blade, cutting metal.
- Fix the blade in hacksaw frame.
- Apply method of holding work piece and explain rules of sawing.

3.3: Files and filing
- Label the different parts of file.
- Differentiate file by their shapes, sizes and cuts.
- Select file for the shaping different types of the metal and surface finish accuracy +-0.2mm.
- Apply method of the holding, balancing and the direction of the filing.
- Clean and store the files.

3.4: Reamer and reaming
- Select appropriate types of reamers, hand, taper and adjustable reamers.
- Select the holding device and drill speed.
- Apply proper method for reaming on different size of hole.
- Clean and store the reamers.

3.5: Thread and threading
- Explain the taps, dies, handle, kinds of the thread, size, angle, main part of the thread and uses.
- Apply appropriate method of the producing the thread by the taps and dies, lathe machine, rolling, pressing.
- Clean and store the tools.

3.6: Scraper and scraping
- Identify the flat, three side and curve scraper.
- Apply the method of the scraping and the qualities of the surface.

Unit 4: Measuring instrument [2]

4.1: Identify the vernier caliper, micrometer, try square, bevel protractor, wire, and filler radius and thread gauge.

4.2: Label main parts of the measuring instrument, accurately reading the scale of the measuring instrument.

4.3: Apply the rules of measuring and using the measuring instrument.

4.4: Care and store the measuring instrument.

Unit 5: Rivet and riveting [1]

5.1: Identify the rivets, size, head, metal, riveting sets punches.
- Calculate the length, diameter of rivet and head.
- Explain the procedure of the riveting and the joints mistakes.

Unit 6: Solder and soldering [1]

6.1: Name of the soldering iron, types of solder, cleaning tools and the fluxes.

- Select the source of heat and temperature.
- Explain the procedure of cleaning and the joining work metal.
- Care and the prevent solder.

Unit 7: Shear and shearing [1]

7.1: Identify the hands, press, torch, snip, shear tools.

- Select the method of the shearing sheet, rod, and square, flat angle metal.
- Shear different metals with appropriate shearing machine.
- Care and maintain the shearing machine.

Unit 8: Bend and bending [1]

8.1: Name of the bending devices, vice pliers, range, hand bar and fork.

- Select the folding, radius bending and rolling.
- Explain the method of bending the metal bar, flat and the plate.
- Bend the metal into many shapes and maintain of the tolls and equipments.

Unit 9: Power tools [2]

9.1: Drill machines

- Identify the hand drill machine, bench, gang, colon and radial drill machine.
- Select the correct types of the machine.
- Apply the correct method of using the drilling machine.
- Calculate the correct speed and the fit different size of the drill bits.
- Explain the holding technique for different shape of metal..

9.2: Drill and drilling

- Identify the different kinds of drill bits, size, purpose and angle.
- Select appropriate drill bit holding accessories, equipments.
- Explain the procedure to operating different types of drill machine, drill holes and acceptable standards.
- Label the parts of the drill machines and explain the function.
- Operate the machine safely and use safety equipments.

Unit 10: Hand tools [4]

10.1: Hand tool metal

- Identify the all hand tools (divider, saw, wood chisel, hammer, wild stone, planner, boring, drilling, driving, cramping and the holding tools) used in mechanical workshop.
- Explain their uses in mechanical workshop.
- Care and maintainance of hand tools.

10.2: Marking tools

- Identify sheet metal, marking tools, scriber, rules, try square, punch, divider, trammel, depth gauge and explain uses of sheet metal.
- Select appropriate hand 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

- Identify the drill machine, jig saw, planner, circular saw, hand saw and routers bending, rollers, folders etc.
- Explain, select, adjust, controls and to operate the power tools.
- Operate different power tools.

10.4: Development sheet

- Select the lines and develop for apply in the workshop.
- Mark cut and the produce patterns, templates for sheet boxes, book stand, scoop, tool box, funnel pipe and machine guards.

10.5: Sheet metal joining

- Familiar with the proportions of the sheet metal joints, relative the tools.
- Cut the sheet for final shape or the forming.
- Uses the hand tools for the single and double edge lap joints.

10.6: Safety

- Explain different machine and tool safety.
- Explain safety for different metal handling.
- Care and maintain different tools and equipments used in mechanical workshop.

Unit 11: Wood work and working [5]

11.1: Timber

- Explain different types of timber.
- Identify the defects of timber.
- Select appropriate timber for different furniture.
- Store and seasoning of the timber.

11.2: Timber work

- Setting, marking and cutting of timbers. Using saw and cutting tools.
- Wood work joints, halving, notching, cogging, bridle, mortise, tenon and dove tails.
- Make different types of joint, lengthening, bearing, widening and angle.
- Select the timber, plywood and fitting accessories and fastening materials.
- Construction carpentry: Assemble the door frames, leveling, and bracing for fixing to the brick work. Correct sizes for hanging, closing and securing to produce bracket, shelve, table and tool box.
- Handle the tools safely and efficiently. The replace guards rules of the general safety in the wood workshop.

Practical

The tasks listed below are performing during the project work provided on next page.

1. Marking : straight, curve ,dot
2. Measuring: rules, vernier caliper, gauge
3. Hammering: ball, cross, soft straight pin
4. Sawing: hand hacksaw and power
5. Filling: single, double and rasp cut files

6. Chiseling: flat, cross, concave, power chisel
7. Reamering: hand and adjustable
8. Threading: tap and dies
9. Riveting: riveting sets pup riveter
10. Soft soldering: Solder, heat joint metal
11. Shearing: Snip, press folds
12. Bending: plier, range, hand, bar, fork and power tools
13. Power tools operating: drill, folding, rolling, radius bending, spot welding, grinding, beading, creping, edge forming, hacksaw machines
14. Drilling: Counter sink, counter boring, reaming, thread cutting
15. Sheet metal working: Hands pipe bend plot, blow horn, groove and seaming
16. Developing: templates, for the sheet boxes, book stand, scoop funnel, pipe and the machine guards
17. Wood working: Marking, measuring, sawing, chiseling, boring, planning, drilling, cramping, holding, size facing
18. Joining: Halving, notching, cogging, bridle, tenon dovetails joints, wide and angle joining

Project list

S. N.	Project	Skill	Metal	Size (mm)	Time (hrs)
1.	Paper weight	Measuring, marking, sawing, filing	M. S. rod 1 pc	Ø 30x30	8
2.	Dove tail	Measuring, marking, drilling, sawing, fitting, mail and female, Scrapping	M.S. flat 2 pc	6x30x51	10
3.	G. Clamp	Measuring, marking, dot, punching, drilling, chiseling, sawing, filing		10x100x70	18
4.	Try square	Measuring, marking, cutting, filing, riveting, drilling	M.S. flat M.S. sheet	10x20x80 2x15x120	16
5.	Hanger	Measuring, marking, bending, joining	G. I. wire	Ø 3x800 or 1000	4
6.	G.I. box	Measuring, marking, cutting, hem, seaming, folding, riveting, soldering	G.I. sheet 22 gauge	200x200	5
7.	Funnel	Measuring, marking, rolling, seaming, soldering	G.I. sheet 22 gauge	100x300	5
8.	Store box	Measuring, marking, hamming, seaming, cutting, folding, riveting	G.I. sheet 22 gauge	400x500	6
9.	Practical test	Sharping the hand tool and power tool, evaluate all the bench work	As per need	As per need	8
10.	Make a platform (pirka)	Measuring, marking, sawing, chiseling, planning, angle joining, fitting	Required Wood	Required Wood	10
				Total (hours)	**90**

References:

1. Workshop technology (Vol -1), S.K. Hajra Chaudhary
2. Shop theory (Vol -1), Henp Fort trade school
3. Manufacturing process, S.K. Hajra Chaudhary

Electrical Engineering I

EG 1108 EE

Total: 7 hours/week
Year: I **Lecture: 4 hours/week**
Semester: I **Tutorial: hours/week**
Practical: 3 hours/week
Lab: hours/week

Course Description:
This course deals with fundamentals of electric current and the basic laws that deal with electrical network analysis.

Course Objectives:
After completing this course the students will be able to:
1. understand the basic concept of electric current and voltage
2. understand the fundamental principles of electricity and electromagnetism
3. identify the basics network theorems and their use

Course Contents:

Unit 1: Introduction **[10]**
- 1.1. Matter, molecule and atom
- 1.2. Electric charge and current
- 1.3. Potential difference and electromotive force
- 1.4. Resistance and its variation with temperature
- 1.5. Direct and alternating current
- 1.6. Series and parallel circuits, Ohm's law
- 1.7. Electric power and energy

Unit 2: Electric Circuit Fundamentals **[10]**
- 2.1. Electric current and voltage
- 2.2. Circuit elements: Resistor, Inductor, Capacitor
- 2.3. Voltage and current sources
- 2.4. Independent and dependent sources
- 2.5. Series and parallel circuits
- 2.6. Electric power and energy

Unit 3: DC Network Theorems and Circuit Analysis **[10]**
- 3.1. Kirchhoff's current and voltage laws
- 3.2. Thevenin's theorem
- 3.3. Nortorn's theorem
- 3.4. Superposition theorem
- 3.5. Maximum power transfer theorem
- 3.6. Mesh current method of circuit analysis
- 3.7. Node voltage method of circuit analysis

Unit 4: Electrostatics **[12]**
- 4.1. Laws of electric forces
- 4.2. Electric field, electric fluxes and flux density
- 4.3. Dielectrics and permittivity
- 4.4. Electric potential, potential difference
- 4.5. Capacitors and capacitance
- 4.6. Series and parallel connection of capacitors

4.7. Energy stored in charged capacitor, charging and discharging of capacitor, phasor diagram of current / voltage relationship in capacitor

Unit 5: Electromagnetism and Electromagnetic Induction [10]

5.1. Definition of magnetic field, magnetic flux, flux density, filed intensity and permeability of magnetic material, domain theory of magnetism
5.2. Magnetic field due to current carrying conductor, force on a current carrying conductor
5.3. Faraday's laws of electromagnetic induction, induced EMF, lenz's law
5.4. Magnetic circuit concept, analogy to electric circuit
5.5. Hysteresis loop for magnetic material, hard and soft magnetic material
5.6. Inductor and inductance
5.7. Energy stored in a current carrying inductor and phasor diagram relationships of current and voltage in inductor

Unit 6: Electrolysis and its Application [8]

6.1. Faraday's law of electrolysis and its applications
6.2. Primary and secondary cells: definitions and examples, internal resistance of cell
6.3. Lead acid cell: construction, chemical reaction during charging and discharging, methods of charging (constant voltage and constant current charging)
6.4. Dry cell, Mercury cell, Ni-Cd cell, Li-ion cell
6.5. Series and parallel connection of cells

Practical Exercises:

1. Verification of Ohm's law
2. Verification of Kirchhoff's current and voltage laws
3. Resistance and resistivity of wire
4. Wheatstone bridge
5. Verification of maximum power transfer theorem
6. Basic application of electromagnets
7. Electromagnetic induction
8. Inductance and capacitance in DC circuits
9. Measurement of internal resistance of batteries
10. Charging and discharging of lead acid battery

References:

1. *A textbook of Electrical Technology* by B.L Theraja and A.K. Theraja
2. *Fundamentals of Electrical Engineering* by J. B. Gupta
3. *Principles of Electrical Engineering* by Vincent Del Toro
4. *Foundations of Electrical Engineering* by R.J. Cogdell

Second Semester

Subjects:

EG 1201 SH	Engineering Mathematics II
EG 1202 SH	Engineering Physics II
EG 1203 SH	Engineering Chemistry II
EG 1204 ME	Engineering Drawing II
EG 1205 ME	Workshop Technology II
EG 1206 EE	Electrical Engineering II
EG 1207 CT	Introduction to Computers
EG 1208 EX	Electronics Devices and Circuits I

Engineering Mathematics II

EG 1201 SH

Total: 4 hour /week
Year: I **Lecture: 3 hours/week**
Semester: II **Tutorial: 1 hours/week**
Practical: hours/week
Lab: hours/week

Course Description:

This subject consists of five units related to vectors; algebra; calculus; geometry; and statistics necessary to develop mathematical background helpful for the understanding and practicing the related engineering works.

Course Objectives:

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

1. Explain the concepts of vectors in plain and vectors in space and apply them in the field of the related engineering area
2. Explain the concepts of the complex numbers, linear inequalities and programming apply them in the field of the related engineering area.
3. Explain the concepts of determinants and matrices and apply them in the field of the related engineering area
4. Explain the concepts of determinants and matrices and apply them in the field of the related engineering area
5. Explain the concepts of applications of derivatives and areas of curves and apply them in the field of the related engineering:
6. Explain the concepts of coordinates in space and planes and apply them in the field of the related engineering area
7. Explain the concepts of statistics and apply them in the field of the related engineering area.

Course Contents:

Unit 1. Vectors: [9]

1.1. Vectors in plane, addition and subtraction.
1.2. Composition and decomposition of vectors.
1.3. Vectors in space.
1.4. The unit vectors i, j, k
1.5. Product of two vectors-
- dot product,
- cross product,

1.6. Simple applications.

Unit 2. Algebra: [15]

2.1. Complex number in the from A+ ib.
- Algebra of complex numbers.

- Polar representation of complex numbers.

2.2. De Moivre's theorem and its applications

2.3. Linear inequalities and their graphs.

- System of linear inequalities in two variables,
- System of linear inequalities in two variables,
- Linear programming: Problems involving two variables under given linear constraints

2.4. Determinants and matrices,

- Algebra of matrices,
- Properties of determinants,
- Ad joint and inverse of matrices.
- Solution of linear equations using cramers' rule
- Row equivalent matrices
- Idea of polynomial equations

Unit 3. Calculus: [9]

3.1. Applications of derivatives-

- Tangents and normal to a curve taking slope as derivative
- Maxima and minima of a function
- Derivative as rate of change

3.2 Areas under curves:

- Use of definite integral as limit of a sum to find areas under curves
- Areas of closed curves and
- Areas between curves.

3.3 Antiderivatives:

- Curve tracing, maxima and minima
- Rieman sums & integral
- Application of fundamental theorem

Unit 4. Geometry: [6]

4.1. Coordinates in space,

4.2. Coordinates in planes.

Unit 5. Statistics: [6]

5.1. Statistics:

- Introduction to statistics
- Measures of Central Tendency
- Measures of Dispersion
- Moments, Skew ness and Kurtosis
- Correlation and Regression

5.2. Probability:

- Concept of Probability
- Concept of conditioned probability
- Concept of independent and dependent events
- Concept of mutually exclusive events

Learning materials:

1. A Textbook on Engineering mathematics (for Diploma in Engineering) part II, Bhim Prasad kafle, Makalu Publicartion House, Dillibazar, Kathmandu
2. A Text book of Statistics – B.C. Bajracharya
3. Elementary Statistics – H. C. Saxena
4. Statistical Methods – Mrigendralal Singh
5. Engineering Mathematics I, Hari Nandan Nath, Parishowar Acharya, Vudhyarthi Publisher and distributors, Bhotahity, Kathmandu
6. 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.
7. 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 Physics II

EG 1202 SH

Total: 6 hour /week

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

Semester: II **Tutorial: 1 hours/week**

Practical: hours/week

Lab: 2 hours/week

Course Description:

This subject consists of four units related to electricity, waves, properties of matter, and modern physics necessary to develop background in physics that supports for the understanding and practicing the related engineering works.

Course Objectives:

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

1. Explain the basic concepts related to the electricity and apply it in the field of the related engineering area
2. Explain the basic concepts related to the waves and apply it in the field of the related engineering area
3. Explain the basic concepts related to the properties of matter and apply it in the field of the related engineering area
4. Explain the basic concepts related to the modern physics and apply it in the field of the related engineering area.

Content Contents:

Unit 1. Electricity: [16]

1.1. Electrostatics:

- Elementary charge, charging and induction.
- Faraday's ice-pail experiment.
- Idea of electric field
- Lines of forces.
- Coulomb's law.
- Intensity of electric field.
- Electrostatic potential, equipotential.
- Surfaces.
- Potential and field strength.
- Potential gradient.
- Action of point.
- Van de Graaf generator.
- Capacitors.
- Different types of arrangement of capacitors.
- Energy storage.
- Action of dielectrics

1.2. Current electricity:

- Basics:
- D.C. Current.
- Strength of Current.
- Potential difference across a conductor.
- Ohm's law and its verification.
- Resistance and resistivity.
- Electrical measurements:
- Galvanometer, Ammeter and voltmeter
- Conversion of Galvanometer into Ammeter and voltmeter
- Potentiometer and comparison of emf and measurement of internal resistance
- Kirchhoff's law and their use to analyze simple circuits, Whitestone bridge
- Heating effect of current:
- Joules law and it's verification, electric power, maximum power theorem
- The rate of heating from the concept of p.d.
- Thermoelectricity:
- See-beck effect, variation of thermo e.m.f. with temperature
- Peltier effect and
- Thomson effect.

1.3. Magnetic effect of current and electromagnetism:

- Magnetic forces and magnetic field of current:
- Force experienced by charge moving in magnetic field.
- Maxwell's crockscrew rule.
- Force applied by magnetic field on current carrying conductor.
- Torque on current carrying coil in magnetic field.
- Theory of moving coil galvanometer.
- Biot-Savart's Law
  - Field due to a long straight conductor and due to circular coil.
  - Force between two parallel conductors carrying current.
- Ampere’s law
  - Magic field due to the solenoid and long straight conductor.
- Electromagnetic induction:
- Faraday's law of electromagnetic induction and Lenz’s law.
- Phenomenon of self-induction.
- A.C. generator.
- D.C. generator.
- Transformer.

1.4 Alternating current:

- Instantaneous and effective values of current and voltage.
- Phase between current and voltage across different elements of circuit.
- Capacitive and inductive reactance.
- Impedance.
- Resonance.
- Power in a.c. circuit

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

2.1. Wave motion:

- Wave motion.
- Types of wave motion
- Characteristics of wave motion
- Wavelength, frequency and speed of waves
- Speed of waves in different media.
- Velocity of sound in air.

2.2. Wave phenomena:

- Sound waves.
- Beats and their formation.
- Progressive waves.
- Stationary waves.
- Waves in strings and pipes: fundamental vibrations and overtones.
- Intensity of sound.
- Intensity level.
- Inverse square law.

2.3. Physical optics:

- Interference of light waves and coherent sources.
- Phase difference and path difference. Young's double slit experiment.
- Introduction of Diffraction of light waves.
- Introduction of of Huygen's principle.
- Polarization and un polarized lights, polarization by reflection(Brewster's law)

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

3.1 Elasticity:

- Elasticity, Hook's law, Young's modules, Bulk modulus
- Elasticity of shear.

3.2 Surface tension:

- Intermolecular attraction in liquid, surface tension.
- Cohesion and adhesion, angle of contact, capillary action
- Coefficient of surface tension and surface energy (Only introduction).

3.3 Viscosity:

- Stream line and turbulent flows.
- Idea of liquid layer, Velocity gradient, Viscosity and its coefficient.
- Comparison of viscosity with solid friction, Viscous forces, Stoke's law, Terminal velocity, determination of coefficient viscosity

Unit 4. Modern physics: **[10]**

4.1 Atomic physics:

- Photons, Photoelectric effect, Einstein's photoelectric equation and stopping potential for photoelectrons.
- Motion of charged particles in simultaneously applied electric and magnetic fields, e/m for electron, Milliken's oil drop experiment. Bohr model for hydrogen atom. Energy level diagrams and spectral series.

- X-rays:Production, nature and uses.
- Laser (introduction only)

4.2 Semiconductors:

- Energy states of valent electrons in solids, energy bands.
- Semiconductors, intrinsic and doped, p-type and n-type semiconductors.
- Majority and minority carries.
- Acceptors and donors, p-n junction, diode and depletion layer, forward and reverse bias.
- Rectifying property of diode
- Transistor and it's uses

4.3 Nuclear physics:

- Laws of radioactive disintegration: half life, mean life, and decay constant.
- Stable and radioactive nuclei.
- Binding energy and mass defect
- Fission and fusion.

Engineering Physics Practical II: ***[30]***

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 characteristic curves of npn transistor.
10. Determine unknown resistance by Wheatstone bridge method.

Learning materials:

Text books:

1. Advanced level physics by Nelkon and Parker Vth and later editions
2. A textbook of physics, part I and part II by Gupta and Pradhan
3. Numerical problems in Engineering Physics for Diploma in Engineering I & II, Pankaj Sharma Ghimire & Krishna Shrestha, S.K. Books, Dhapasi, Kathmandu

Text book for laboratory work:

1. Physics Practical Guide by U.P. Shrestha, RPB

Other learning materials:

3. 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
4. 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 Chemistry II

EG 1203 SH

Total: 6 hour /week

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

Semester: II **Tutorial: 1 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 synthetic materials necessary to develop background in chemistry that supports for the understanding and practicing related engineering works.

Course Objectives:

After the completion of this subject, students will be able to explain the basic concepts related to the followings and apply them in the field of related engineering works:

1. Nonmetals and their compounds
2. Metals and their compounds
3. Organic compounds and synthetic materials

Course Content:

Unit: 1: Non-metals and their compounds: [20]

1.1 Water:
- Source of water
- Hard and soft water
- Removal of temporary and permanent hardness of water
- Water treatment of domestic and industrial purpose

1.2 Ammonia:
- Lab preparation
- Manufacture by Haber's process
- Properties and uses

1.3 Nitric acid:
- Manufacture by Ostwald's process
- Properties and uses.
- Nitrogen cycle
- Fixation of Nitrogen
- Chemical fertilizers
- Oxides of nitrogen as pollutant (general concept)
- Acid rain (due to oxides of nitrogen and oxide of Sulphur "Sulpher dioxide")

1.4 Halogens (Chlorine):
- Lab preparation

- Properties and uses

1.5 Hydrochloric acid:
- Lab preparation
- Properties and uses

1.6 Hydrogen Sulphide:
- Lab preparation
- Properties and uses

1.7 Sulphuric acid:
- Manufacture by contact process)
- Properties and uses

1.8 Carbon and its compounds:
- Allotropes of carbon (reference of diamond & graphite & their structure).
- Oxides of carbon (Ref. carbon dioxide & carbon mono oxide as pollutants)- general idea only

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

2.1 General study of metals and their components:
- Difference between metal and non metal
- Combined & free state of metals
- Chemistry of Metallic Carbonates, Sulphates, Chlorides and Nitrates

2.2 Alkali metals:
- General characteristics of Alkali metals
- Properties & uses of sodium

2.3 Alkaline earth metals:
- General characteristics of the Alkaline earth metals
- Properties & uses of calcium

2.4 Aluminum:
- Properties and uses

2.5 Coinage metals:
- General properties of coinage metals
- Properties and uses of cupper

2.6 Zinc:
- Properties & uses

2.7 Iron:
- Properties & uses

2.8 Lead:
- Properties & uses

2.9 Alloys:
- Definition
- Purpose of making alloys
- Types of alloys

Unit: 3: Organic compounds and synthetic materials: [10]

3.1. Organic compounds
- Organic compounds:
  - Historical background, classification, and nomenclature

- Functional groups and homologous series
- Saturated hydrocarbon: Properties of Methane
- Unsaturated hydrocarbon: Properties of Ethylene and Acetylene
- Aromatic compounds:
  - Definition
  - Comparison of aliphatic and aromatic compounds
  - Properties of Benzene

3.2. **Synthetic materials:**

- Polymer and polymerization
  - Definition
  - Types of polymer
- Rubber:
  - Types (Natural and Synthetic)
  - Preparation and uses.
- Polyvinyl chloride (PVC):
  - Preparation and uses
- Polythene:
  - Preparation and uses

Engineering Chemistry Practical II:

1. To compare the hardness of different types of water [2]
2. To prepare Bakelite (resin) in the laboratory [2]
3. To determine the condition in which corrosion takes place [2]
4. To investigate the action of acids on some metals (Zn, Mg, Fe, Al, Sn & Cu) (acids: HCl, H_2SO_4(dil.)& HNO_3 (dil) [2]
5. To prepare and study the properties of hydrogen gas [2]
6. To prepare and study the properties of ammonia gas [2]
7. To 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) [2]
8. To detect the acid radicals (Cl^-, NO_3^{--}, SO_4^{---}, CO_3^{--}) by dry and wet ways (4)
9. To detect the basic radicals (Cu^{++}, Al^{+++}, Fe^{+++}, Zn^{++}, CO^{++}, Ni^{++}, Ca^{++}, Ba^{++}, Mg^{++})by wet ways [6]
10. To detect the acid and basic radicals (complete salt analysis) [6]

Textbooks:

1. Foundations of chemistry, Vol-2, M.K. Sthapit and R.R. Pradhananga
2. A text Book of chemistry, Jha & Guglani
3. A text Book of Organic Chemistry, B.S. Bahl & Arun Bahl
4. Elementary qualitative analysis, M.K.Sthapit and C.B.Tuladhar
5. Elementary practical chemistry, MK.Sthapit

Reference books:

1. Inorganic chemistry, Bahl & Tuli
2. Elementary Organic Chemistry, P.N. Bargava
3. Fundamentals of chemistry, K.R. Palak
4. A text Book of Inorganic Chemistry, L.M. Mitra
5. Engineering Chemistry, M.L. Sharma, K.M. Shrestha, P.N. Choudhary
6. A Text book of Engineering Chemistry, Prakash Poudel

Engineering Drawing II

EG1204 ME

Total: 4 hours/week
Year: I **Lecture: 1 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week
Lab: hours/week

Course Description:

This course deals with sectional view, pictorial projections, development of surfaces and intersection of solids.

Course Objectives:

After completing this course the students will be able to:

1. draw sectional view of the given three dimensional solid,
2. draw pictorial projections from the given orthographic views,
3. develop the surfaces of the geometrical solids, and,
4. draw interpenetration line/curve for the given intersecting solids.

Course Contents:

Unit 1: Sectional Views [8]

- 1.1 Use of sectional views
- 1.2 Cutting plane line and hatching lines
- 1.3 Types of Section: Full section and Half Section
- 1.4 Exercises on Full Section [Sheet 1]
  Exercise on Half Section [*Sheet 2]*

Unit 2: Pictorial Projection: Isometric Drawing [12]

- 2.1 Introduction to Axonometric projection
- 2.2 Isometric projection and isometric drawing
- 2.3 Procedure of Making an Isometric Drawing
- 2.4 Non isometric Lines and Non isometric surfaces
- 2.5 Box and coordinate construction method
- 2.6 Angles in isometric
- 2.7 Circles and circular arcs in isometric
- 2.8 Orientation of object in isometric drawing
- 2.9 Exercise on isometric drawing of rectangular objects with horizontal and vertical planes [Sheet 3]
  Exercise on isometric drawing of rectangular objects with inclined planes [Sheet 4]
  Exercise on isometric drawing of objects with cylindrical surfaces and cylindrical holes [*Sheet 5*]

Unit 3: Oblique Drawing [4]

- 3.1 Oblique projection and Oblique drawing
- 3.2 Procedure of Making an Oblique Drawing
- 3.3 Rules for Placing Object in Oblique

3.4 Angles, Circles and Circular Arcs in Oblique
3.5 Cavalier and Cabinet Projection
3.6 Exercise on oblique drawing of objects with plane and curved surfaces [Sheet 6]

Unit 4: Surface Development [16]

4.1 General concepts and practical considerations
4.2 Development of Right solids: Cylinder, Prism, Cone and Pyramid
4.3 Development of Oblique solids: Cylinder, Prism, Cone and Pyramid
4.4 Development of Truncated solids
4.5 Exercise on development of truncated right prism and cylinder [Sheet 7]
Exercise on development of truncated right pyramid [Sheet 8]
Exercise on development of truncated right cone [Sheet 9]
Exercise on development of oblique solids [Sheet 10]

Unit 5: Intersection of solids [12]

5.1 Lines of intersection of geometric surfaces
5.2 Intersection of two cylinders
5.3 Intersection of two prisms
5.4 Intersection of a prism and a cylinder
5.5 Intersection of a prism and a pyramid
5.6 Intersection of a prism and a cone
5.7 Intersection of a cylinder and a cone
5.8 Intersection of a cylinder and a pyramid
5.9 Exercise on intersection of two cylinders, intersection of two prisms, intersection of a prism and a cylinder [*Sheet 11*]
Exercise on intersection of a prism and a pyramid, intersection of a prism and a cone [*Sheet 12*]
Exercise on intersection of a cylinder and a cone, intersection of a cylinder and pyramid [Sheet 13]

Unit 6: Pattern Making [8]

6.1 Pattern of three dimensional solids
6.2 Pattern of geometrical solids
6.3 Pattern of intersecting solids
6.4 Exercise on patterns of any two solid objects from Sheet 1 and 2 [*Sheet 14*]
6.5 Exercise on patterns of any two solid objects from Sheet 7, 8, 9 and 10 [*Sheet 15*]

Reference:

1. Luzadder, W.J., Fundamental of Engineering Drawing, Prentice-Hall of India Pvt-Ltd., New Delhi, Latest edition.
2. Bhatt N. D. and PanchalV. M., Engineering Drawing, Charotar Publishing House, 2001.
3. Gill P.S, Engineering Drawing, S. K. Kataraia & Sons, New Delhi, 2004/2005

Workshop Technology II

EG1205ME

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

Course description:

This course deals with the workshop practice related to foundry and welding of mechanical work performances. Technicians need to acquire advanced techniques and performance standard so as to be competent in the engineering field.

Course Objectives:

After completing this course the students will be able to

1. Apply safety precautions in foundry and welding shops;
2. Make simple patterns from wood and metal as per drawing;
3. Produce casting parts as per supplied drawing using casting tools and equipments;
4. Perform Shield Metal Arc Welding;
5. Perform Oxygen Acetylene Welding;
6. Perform brazing.

Practical exercises:

Unit 1. Foundry practical

1.1 Molding exercise **[15 hrs]**

1. Single wood pattern making
2. Split wood pattern making
3. Core box making
4. Sand molding for split pattern with core
5. Making wax suitable pattern such as anyone of flying bird, twisted spiral coiled or any simple irregular article.

Unit 2. Welding practical

1.2 Arc welding exercise: **[25 hrs]**

1. Safety precaution and familiarization with welding machine and accessories
2. Striking an arc welding on plate
3. Perform padding on flat surface
4. Perform closed and Square butt joint
5. Make corner joint
6. Make Tee joint
7. Make lap joint
8. Make V-butt joint
9. Perform arc cutting on mild steel plate

1.3 Gas *Welding Exercise (practical):* **[15 hrs]**

1. Perform lining without filler rod
2. Perform lining with filler rod
3. Make butt joint
4. Make corner joint
5. Make lap joint
6. Make tee joint
7. Perform straight gas cutting
8. Perform circular gas cutting

1.4 Brazing *Exercise (practical):* **[5 hrs]**

1. Closed square butt joint brazing
2. Braze lap joint
3. Braze Tee joint

Suggestion for instructions:

1. Note: every practical exercise [assignment] must be accompanied with performance report in A4 size paper. Assignments, drawing, and performance report must be submitted for the work evaluation.

References:

1. Elements of workshop technology Vol. I: Manufacturing Processes, S. K. Hajra Choudhary, a. K. Hajra Choudhary, Media promoter & publishers Pvt. Ltd., 20-g Sleater Road, Seervai building. 'B'. Bombay-400 007- 2005 A.D. 14th edition
2. A textbook of workshop technology [manufacturing processes] – R. S. Khurmi & J. K. Gupta, publication division of Nirja construction & development co. Pvt. Ltd.- 15th edition
3. Manufacturing science technology [manufacturing processes & machine tools], K. Vara Prasada Rao, New age international publishers, 4835/24, Ansari road, Daryaganj, New Delhi-110 002

Electrical Engineering II

EG1206EE

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

Course Description:
This course focuses on fundamental concepts of single phase and three phase AC networks, different types of electrical machines and protection schemes.

Course Objectives:
After completing this course the students will be able to:
1. identify AC quantities and active and reactive power
2. understand the basic principles of different types of electrical machines
3. identify the different protection schemes in the system

Course Contents:

Unit 1. Single Phase AC Circuit Analysis [10]
- 1.1 Generation of sinusoidal EMF and its mathematical equations
- 1.2 Definitions of period, frequency, wavelength, phase and phase difference
- 1.3 Instantaneous, peak, average and RMS values
- 1.4 Application of complex number, review of complex number calculation and use of j operator
- 1.5 Phasor representation of AC quantities
- 1.6 Phase relationship in resistance, inductance and capacitance
- 1.7 Reactance of inductance and capacitance
- 1.8 AC excitation for purely resistive, inductive and capacitive circuits
- 1.9 AC excitation for RL, RC and RLC series and parallel circuits
- 1.10 Resonance in RLC series and parallel circuits
- 1.11 Power in AC circuits: active power, reactive power, apparent power, power triangle and power factor

Unit 2. Three Phase AC Circuits Analysis [6]
- 2.1 Generation of 3-phase sinusoidal voltage, phase sequence
- 2.2 Advantage of 3-phase system
- 2.3 Line and phase quantities (current, voltage)
- 2.4 Star and delta connection of 3-phase source and load.
- 2.5 Power in 3-phase circuits
- 2.6 Transmission and distribution in three phase system

Unit 3. Transformers [5]
- 3.1 Construction and working principle of transformers
- 3.2 Step up and step down transformers and their uses
- 3.3 Auto transformer and its use
- 3.4 Losses in transformers

Unit 4. DC Machines [6]
- 4.1 Construction of DC machine
- 4.2 Principle of DC motor action
- 4.3 Series, shunt and compound motors, their characteristics and application
- 4.4 Speed control in DC motors

4.5 DC machine working as DC generator

Unit 5. AC Motors/Generators [8]

5.1 Construction, working principle and characteristics of three phase induction motor
5.2 Induction machine as generator
5.3 Construction, working principle and characteristics of three phase synchronous generators
5.4 Synchronous machine as motor
5.5 Single phase induction motors, capacitor start motor, shaded pole motors, pulse and hysteresis motors

Unit 6. Safety techniques and Protection [6]

6.1 Safety devices such as fuses, circuit breakers, thermal strips, isolating transformers etc.
6.2 Identification and use of protective devices
6.3 Earthing and its importance
6.4 Earthing material and procedure
6.5 Lightning protection and lightning arrestors

Unit 7. Illumination [4]

7.1 Importance of illumination
7.2 Luminous flux and intensity
7.3 Simple calculations required for determining light intensity

Practical Exercises:

1 AC excitation in RL and RC circuits
2 Use of oscilloscope to measure AC quantities such as peak value, RMS value, frequency, time period etc.
3 Active and Reactive and apparent power measurements in RLC circuits
4 RLC series resonance circuits
5 Phase and line quantity measurements in 3 phase star/delta circuits
6 Step-up and step down transformers.
7 DC motors characteristics
8 Speed control of DC motors
9 Induction motors characteristics
10 Earthing and earth resistance measurement

References:

1 *A textbook of Electrical Technology* by B.L Theraja and A.K. Theraja
2 *Fundamentals of Electrical Engineering* by J. B. Gupta
3 *Principles of Electrical Engineering* by Vincent Del Toro
4 *Foundations of Electrical Engineering* by R.J. Cogdell
5 *Basic Electrical Engineering* by A.E. Fitzgerald

Introduction to Computers

EG 1207 CT

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

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

Course Objectives:
After completing this course the student will be able:
1. To understand the basic architecture of Computer.
2. To understands the different Operating Systems
3. To use the different Software applications.
4. To install and use the different peripheral devices
5. To understand and use Network and Internet.

Course Contents:

Unit 1. Fundamentals **[2]**

1.1 Evolution of Computer
1.2 Classification
- Operation
  - Analog and Digital
- Uses of Computer
  - General purpose
  - Specific purpose
- Capacity
  - Main Frame computer
  - Mini computer
  - Personal computer
  - Super computer
  - Notebook /laptop / palm top / PDA

Unit 2. Basic Architecture **[8]**

2.1 Building blocks of a PC
- Block diagram - Input /Output, processor, memory and bus
- Central Processing Unit
  - 286, 386 and 486 processors
  - Pentium, Pentium II, Pentium III, Pentium IV, Core 2 Duo
  - Data lines, address lines and registers
- Memory devices
- Input/Output devices
  - Command Oriented control and text input by keyboard
  - Action oriented control and graphical input by mouse

- Visual output on monitor
- The storage devices
  - Floppy Disk
  - Hard disk
  - Volatile and Non Volatile
  - Performance
  - Concepts of heads, cylinders, sectors
  - Installation Guidelines

Unit 3. Operating System [4]

3.1 Definition and Classification

3.2 Functions of OS

- Command Interpretation
- Resource allocation and management
- Services

3.3 DOS, Windows, Mac OS, Unix, Linux, and OS/2

Unit 4. Programming Languages, Interpreters and Compilers [2]

4.1 Basic ideas of Programming Languages

4.2 Assembler

4.3 Interpreter

4.4 Compiler A.J. Linker

Unit 5. Software Applications [4]

5.1 Word Processor

- Features in different word processing packages
- Formatting documents
- Uses

5.2 Spreadsheet

- Features in different Spreadsheet packages
- Formatting documents, graphs and charts
- Uses

5.3 Database

- Features in different database packages
- Tables and fields
- Uses

5.4 Graphics

- Features in different graphics, page layouts
- Image editing
- File extensions
- Uses

5.5 Features in different Engineering Software Packages

Unit 6. Peripherals and Accessories [4]

6.1 Printers

- Different printing technologies
- Comparison in terms of quality, cost and performance
- Printer Sharing in Network Environment
- Installation guidelines

6.2 Scanner

- Different types of scanners available
- Installation Guidelines

6.3 Mouse
- Mechanical and Optical Mouse

6.4 CD-R/W/Optical Drive/Tape Drive
- Operating principles
- Concepts of Backup

Unit 7. Network and Internet [5]

7.1 Brief Introduction of LAN, MAN, WAN
7.2 Topologies: Bus, Ring and Star
7.3 Hub
7.4 Switch
7.5 Modem
7.6 Network Cabling
7.7 NIC
7.8 Network OS
7.9 Internet
- ISP
- E-mail
- WWW
- Search Engines
- Statistical Information of Internet

Unit 8. Computer Applications [1]

8.1 Applications in different fields
8.2 Future Developments

Practical

1. Identification of hardware components
2. Assembling a computer
3. Physical Installation Procedures
   - 3.1. Memory Module Physical Installation Procedure
   - 3.2. Motherboard Physical Installation Procedure
   - 3.3. Hard Disk Drive Physical Installation Procedure
   - 3.4. CD-ROM Drive Physical Installation Procedure
   - 3.5. Processor Physical Installation Procedure
   - 3.6. Heat Connector Physical Installation Procedure
   - 3.7. PS/2 Mouse Port Connector Physical Installation Procedure
   - 3.8 Video Card Physical Installation Procedure
4. Safety precaution concept
5. Management of Hard disk (partitioning / formatting)
6. Installation of application programs
7. Installation of utilities programs
8. Application on
   - 8.1. Word processing
   - 8.2. Spreadsheets
   - 8.3. Presentation tools
   - 8.4. Prepare presentation of class work

9. Installation of OS and drivers
10. Introduction and Installation of network interface card and various network devices like hub, switch, router etc.
11. Network Cabling

References:

1. Winn Rosch, " Harware Bible"
2. Noel Kalicharan, " Introduction to computer Studies" , Cambridge Low Price Edition
3. P.K Sinha, " Computer Fundamentals"
4. Rajaraman V.**,** "Fundamentals Of Computers" , PHI

Electronics Devices and Circuits I

EG1208EX

Total: 6 hours/week

Year: I **Lecture: 4 hours/week**

Semester: II **Tutorial: hours/week**

Practical: 2 hours/week

Lab: hours/week

Course Description:

This course deals with various types of electronic devices and circuits required for the electronic works.

Course Objectives:

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

1. Identify and explain the working principles of various semiconductor devices, relate their characteristics and applications.
2. Explain the characteristics of CB, CE and CC configuration circuits.
3. Identify and explain the working of transistors in various configurations;

Course Contents:

Unit 1. Semi conductor physics: [8]

1.1. Review of basic atomic structure and energy levels,
1.2. Concept of insulators, conductors and semi- conductors,
1.3. Atomic structure of Ge and Si, covalent bonds concept of intrinsic and extrinsic semi-conductor
1.4. P and N impurities, Doping of impurity.
1.5. P and N type semiconductors and their conductivity.
1.6. Effect of temperature on conductivity of intrinsic semi conductor.
1.7. Energy level diagram of conductors, insulators and semi conductors
1.8. Minority and majority carriers.

Unit 2. Semi conductor diode: [10]

2.1. PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, and concept of junction capacitance in froward and reverse bias condition.
2.2. V-I characteristics, static and dynamic resistance and their calculation from diode characteristics.
2.3. Diode as half wave, full wave and bridge rectifier.
2.4. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter and LC filter.
2.5. Types of diodes, their brief characteristics and applications,
2.6. Zener and avalanche breakdown.

Unit 3. Introduction to Bipolar transistor: [10]

3.1. Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow.
3.2. Current relations in transistor, concept of leakage current.
3.3. CB, CE, CC configuration of the transistor.

3.4. Input and output characteristics in CB and CE configurations, input and output dynamic resistance in CB and CE configurations, Current amplification factors.
3.5. Comparison of CB CE and CC Configurations.
3.6. Transistors as an amplifier in CE Configurations, d.c load line and calculation of current gain, voltage gain using d.c load line.

Unit 4. Transistor biasing Circuits: [6]

4.1. Concept of transistor biasing and selection of operating point.
4.2. Different types of operating point, need for stabilization of operating point.

Unit 5. Single stage transistor amplifier: [8]

5.1. Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit.
5.2. Explanation of phase reversal of output voltage with respect to input voltage.
5.3. h- Parameters and their significance.
5.4. Calculation of current gain, voltage gain, input impedance and output impedance using h-parameter.

Unit 6. Field effect Transistors [10]

6.1. Construction.
6.2. Operation and characteristics of FET.
6.3. Operation and characteristics of MOSFET in depletion and Enhancement mode.
6.4. C MOS- advantages and applications.
6.5. Comparison of JFET, MOSFET and BJT.
6.6. FET amplifier circuit and its working principle. (No Derivation)

Unit 7. Special Semiconductor Devices [8]

7.1. LED and LCD, charactersitcs and applications
7.2. Photo transistor and Photo cell, characteristics and applications
7.3. Optocoupler and isolator brief introduction
7.4. Hall Effect Devices brief introduction and application
7.5. Solid state relays, their principle and application

LIST OF PRACTICALS

1. Familiarization with operation of following instruments: Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant electrical quantities.
2. Plot V-I characteristics for PN junction diode
3. Plot V-I characteristics of Zenor diode
4. Observe the wave shape of following rectifier circuit
a. Half wave rectifier b. Full wave rectifier c. Bridge rectifier
5. Plot the wave shape of full wave rectifier with
a. Shunt capacitor filter b. Series inductor filter c. Filter
6. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
7. Plot input and output characteristics and calculate of parameters of transistors in CB configuration.
8. Plot V-I characteristics of FET amplifier.
9. Measure the Q-Point and note the variation of Q-Point.
a. By increasing the base resistance in fixed bias circuit.
b. By changing out of bias resistance in potential divider circuit.
10. Measure the Voltage Gain, input, output impedance in single state CE amplifier circuit.

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi

Second Year
(Third and Fourth Semesters)

Third Semester

Subjects:

EG 2102 EX	Electronic Devices & Circuits II
EG 2103 EX	Electronics Drawing
EG 2104 SH	Engineering Mathematics III
EG 2104 EX	Digital Electronics I
EG 2107 CT	Computer Programming and Applications
EG 2107 EE	Electrical Installation
EG 2108 EE	Network Filters and Transmission Lines
EG 2109 EX	Electronics Components and Materials

Electronics Device and Circuit II

EG2102EX

Total: 8 hours/week

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

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Lab: hours/week

Course Description:

This course deals with various electronic devices and circuits, mainly with use of transistors in analog circuits like power amplifier, multistage amplifier, oscillators, wave shaping circuits and in multivibrators etc. It also gives information about timer, operational amplifier, voltageregulator, ICs and their applications for effective functioning in the field of electronic service industry.

Course Objectives:

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

1 Explain operation and function of large and small signal amplifiers with applications.
2 Make simple power supplies and amplifiers and test related circuits.
3 Explain operation and function of various types of oscillators and tuned amplifiers and their applications.

Course Contents:

Unit 1: Multistage Amplifiers **[8]**

1.1 Need for multistage amplifier
1.2 Gain of multistage amplifier
1.3 Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

Unit 2: Large Signal Amplifier **[12]**

2.1 Difference between voltage and power amplifiers
2.2 Importance of impedance matching in amplifiers
2.3 Class A, Class B, Class AB, and Class C amplifiers
2.4 Single ended power amplifiers, push-pull amplifier, and complementary symmetry push-pull amplifier

Unit3: Feedback in Amplifiers **[10]**

3.1 Basic principles and types of feedback
3.2 Derivation of expression for gain of an amplifier employing feedback
3.3 Effect of feedback (negative) on gain, stability, distortion and bandwidth of an amplifier
3.4 RC coupled amplifier with emitter bypass capacitor
3.5 Emitter follower amplifier and its applications

Unit 4: Sinusoidal Oscillators **[12]**

4.1. Use of positive feedback
4.2. Barkhausen criterion for oscillations
4.3. Different oscillator circuits-tuned collector, Hartley Colpitts, phase shift,
4.4. Wien's bridge and crystal oscillator. Their working principles and simple numerical problems
4.5. Series and parallel resonant circuits and bandwidth of resonant circuits
4.6. Single and double tuned voltage amplifiers and their frequency response characteristics

Unit 5: Wave Shaping Circuits [6]

5.1. General idea about different wave shapers
5.2. RC and RL integrating and differentiating circuits with their applications
5.3. Diode clipping and clamping circuits and simple numerical problem on the circuits

Unit 6: Multivibration Circuits [8]

6.1. working principle of transistor as switch
6.2. Concept of multi-vibrator: astable, monostable, and bistable and their applications
6.3. Block diagram of IC555 and its working
6.4. IC555 as monostable and astable multi-vibrator

Unit 7: Operational Amplifiers [11]

7.1. Characteristics of an ideal operational amplifier and its block diagram
7.2. Definition of differential voltage gain, CMMR, PSRR, slew rate and input offset current
7.3. Operational amplifier as an inverter, scale changer, adder, subtractor, differentiator, and integrator
7.4. Concept of Schmitt trigger circuit and sample/hold circuit using operational amplifier and their application

Unit 8: Regulated DC Power Supplies [8]

8.1. Concept of DC power supply. Line and load regulation
8.2. Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)
8.3. Idea of SMPS

LIST OF PRACTICALS

1. Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
2. To measure the gain of push-pull amplifier at 1KHz
3. To measure the voltage gain of emitter follower circuit and plot its frequency response
4. Plot the frequency response curve of Hartley and Colpitts Oscillator
5. Plot the frequency response curve of phase shift and Wein bridge Oscillator
6. To observe the output waveforms of series and shunt clipping circuits
7. To observe the output for clamping circuits
8. To observe the output waveform of a Bistable multivibrator

9. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
10. Use of IC 555 as astable multivibrator and observe the output at different duty cycles
11. To use IC 741 (op-amplifier) as
    a. Inverter
    b. Adder
    c. Subtractor
    d. Integrator
12. To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi
2. Electronics Principles by Malvino, Tata McGraw Hills, New Delhi
3. Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi
4. Basic Electronics by Grob, Tata McGraw Hills, New Delhi
5. Art of Electronics by Horowitz
6. Electronic Principles by Sahdev, Dhanpat Rai and Sons, New Delhi.
7. Electronic Circuit Theory by Boylstead
8. Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi
9. Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad
10. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi
11. Electronics Devices and Circuits-II by Naresh Gupta, Jyotesh Malhotra and Harish C. Saini, Eagle Prakashan, Jalandhar

Electronics Drawing

EG2103EX

Total: 2 hours/week

Year: II **Lecture: hours/week**

Semester: I **Tutorial: hours/week**

Practical: 2 hours/week

Lab: hours/week

Course description:

This course deals with ISO standard symbols of electrical/electronics and digital components, simple electrical and electronics circuits and block diagram of some domestic consumable electronics equipment.

Course Objectives:

After completing this course the students will be able to

1. Draw basic electronic symbols (standard /freehand)
2. Draw standard block diagrams.
3. Draw circuit diagram.
4. Interpret the circuit diagrams and block diagrams.

Course contents:

Unit 1. Basic symbols used in electrical and electronics circuits diagrams : [2]

1.1 Fuses, relays, switches, circuit-breakers, motors, generators, transformers, earthings, lamps, tubelites etc.

Unit 2. Basic symbols used in electronic circuits : [2]

2.1 Active components as semiconductor devices (transistors PNP/NPN, diodes, SCR, MOSFET, CMOS, JFET, FET, thyristers.

2.2 Digital electronic devices such as gates (AND,OR,NOT, NAND, NOR, XOR, XNOR, Flip-Flpos)

Unit 3. Passive components such as Resistors, capacitors, Inductors, Variable resisters and capacitors. [2]

Unit 4. Layout and schematic drawing of simple electric circuits [2]

4.1. Light point with one way and two way switches and sockets.

4.2. Two light points with one and two way switches and sockets.

Unit 5. Drawing of simple power supplies. [5]

5.1. Domestic adopter and its circuits diagram.

5.2. Half wave rectification circuit.

5.3. Full wave rectification circuit.

5.4. Centered tap type.

5.5. Bridge type.

5.6. Three-phase rectification circuit.

5.7. Block diagram of SMPS power supply.

Unit 6. Circuit diagram of simple measuring instruments. [5]

6.1 Multirange voltmeter

6.2 Multirange ammeter

6.3 Multirange ohmmeter

6.4 Conversion of ganvanometer to

- Voltmeter
- Ammeter

Unit 7. **Simple circuit diagram of telephone instruments.** **[3]**

Unit 8. **Block diagram of audio equipments.** **[3]**

8.1 Audio amplifier using semiconductors.

8.2 MW/SW/FM Radio.

8.3 Cassette player / recorder

Unit 9. **Block diagram and circuit diagram of monochrome television receiver.** **[3]**

Unit 10. **Block diagram of basic computer. (Input-process-output.)** **[3]**

Engineering Mathematic III

EG 2104 SH

Total: 4 hour /week

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

Semester: I **Tutorial: 1 hours/week**

Practical: hours/week

Lab: hours/week

Course description:

This course consists of Partial derivative, Differential equations, Infinite series, Fourier series, and Elementary group theory necessary to develop mathematical background.

Course objectives:

After completing this course students will able to:

1. Provide the basic mathematical idea for the analysis of electronic circuits and
2. Help in the development of program for the technical applications

Course Contents:

Unit 1. Partial Derivative: **[8]**

1.1 Functions of more than one variables

1.2 Partial derivative, partial differential coefficient.

1.3 Partial derivative of first and higher order.

1.4 Homogeneous function and Euler's Theorem on homogeneous functions.

1.5 Composite function, Derivative of composite functions.(Total differential coefficient)

Unit 2. Differential Equations: **[10]**

2.1 **Ordinary Differential Equations**

2.1.1 Differential Equation and its order and degree.

2.1.2 Differential Equations of first order and first degree,

2.1.3 Differential Equations with separate variables,

2.1.4 Homogeneous and exacted differential Equations

2.2 Partial Differential Equations (PDF)

2.2.1 Basic concepts, definition and formation

2.2.2 General solution of linear PDF of first order (Pp + Qq = R form)

Unit 3. Infinite Series: **[11]**

3.1 Definitions of sequence and infinite series,

3.2 Condition for convergence of an infinite series,

3.3 Geometric series.

3.4 Test of convergence. (p-test, D' alembert's ratio test, Cauchy radical test or root test)

3.5 Power series and its interval of convergence,

3.6 Expansion of functions using Taylor's and Maclaurin's theorems.

Unit4. Fourier series: **[8]**

4.1 Periodic function,
4.2 Even and odd function
4.3 Trigonometric series
4.4 Fourier series of the functions of period 2π,
4.5 Euler's formula,

Unit 5. Elementary Group Theory: **[8]**

5.1. Binary operation, Binary operation on sets and their properties.
5.2. Definition of group
5.3. Group whose elements are not number
5.4. Finite, Infinite group and Abelian group
5.5. Elementary properties of group.

References:

1. Thomas and Finney, *Calculus and Analytical Geometry*, Narosa Publishing House, New Delhi, 1990.
2. E. Kreyszig, *Advanced Engineering Mathematics*, Wiley-Easter Publication, New Delhi, 1990.
3. Chandrika Prasad, *Mathematics for Engineer*, Prasad Mudranalaya, Allahabad, 1996.
4. E. Kreyszig, *Advanced Engineering Mathematics*, Wiley-Easter Publication, New Delhi, 1990.
5. A.V. Oppenheim, *Discrete-Time Signal Processing*, Prentice Hall, India Limited, 1990.
6. K. Ogata, *Discrete-Time Control System*, Prentice Hall, India Limited, 1993.

Digital Electronics I

EG 2104 EX

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

Course description:
This course deals on the basic concepts of digital electronics. It also imparts knowledge on number systems, logic gates, various codes, parities, Boolean algebra, mux and demux, filp-flop, counters and shift registers.

Course Objectives:
After completing this course the students will be able to
1. Learn design methods for combinational logic circuit.
2. Verify truth tables of basic gates universal gates.
3. Learn the design concept of sequential logic circuits.
4. Design problem based / predefined logic based circuits.

Course Contents:

Unit 1: Introduction [2]
- 1.1 Define digital and analog signals and systems, differentiate between analog and digital signals
- 1.2 Need of digitization and applications of digital systems

Unit 2: Number Systems [9]
- 2.1 Decimal, binary, octal, hexadecimal number systems
- 2.2 Conversion of number from one number system to another including decimal points
- 2.3 Binary addition, subtraction, multiplication, division, 1's and 2's complement method of subtraction
- 2.4 BCD code numbers and their limitations, addition of BCD coded numbers, conversion of BCD to decimal and vice-versa
- 2.5 Excess-3 code, gray code, binary to gray and gray to binary conversion
- 2.6 Concept of parity, single and double parity, error detection and correction using parity

Unit 3: Logic Gates [4]
- 3.1 Logic gates, positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operation of NOT, OR, AND, NAND, NOR, EX-OR, EX-NOR gates
- 3.2 NAND and NOR as universal logic gates

Unit 4: Logic Simplification [8]
- 4.1. Rules and laws of Boolean algebra, logic expression, Demorgan's theorems, their proof
- 4.2. Sum of products form (minterm), Product of sum form (maxterms), simplification of Boolean expressions with the help of Rules and laws of Boolean algebra

4.3. Karnaugh mapping techniques upto 4 variables and their applications for simplification of Boolean expression

Unit 5: Arithmetic Circuits [3]

5.1. Half adder, full adder circuits and their operation

5.2. Parallel binary adder, 2-bit and 4-bit binary full adder, block diagram.

Unit 6: Multiplexer/Demultiplexer [4]

6.1. Basic functions, symbols and logic diagrams of 4-inputs and 8-inputs multiplexers,

6.2. Function/utility of 16 and 32 inputs multiplexers,

6.3. Realization of Boolean expression using multiplexer/demultiplexers

Unit 7: Decoders, Display Devices and Associated Circuits [4]

7.1. Basic Binary decoder, 4-line to 16 line decoder circuit

7.2. BCD to decimal decoder, BCD to 7-segment decoder/driver, LED/LCD display

Unit 8: Encoders and Comparators [4]

8.1. Encoder, decimal to BCD encoder, decimal to BCD priority encoder, keyboard encoder

8.2. Magnitude comparators, symbols and logic diagrams of 2-bit and 4-bit comparators

Unit 9: Latches and Flip-Flops [6]

9.1. Latch, SR-latch, D-latch, Flip-flop, difference between latch and flip-flop

9.2. S-R, D flip-flop their operation using waveform and truth tables, race around condition

9.3. JK flip-flop, master slave and their operation using waveform and truth tables

9.4. T flip flops

Unit 10: Counters [8]

10.1. Asynchronous counter, 4-bit Asynchronous counter, Asynchronous decade counter

10.2. Asynchronous counter, 4-bit synchronous binary counter, Asynchronous decade counter

10.3. Up/down Asynchronous counters, divide by N counter MOD-3, MOD-5, MOD-7, MOD-12 counters

10.4. Ring counter, cascaded counter, counter applications

Unit 11: Shift Registers [8]

11.1. Shift registers functions, serial-in-serial out, serial-in-parallel-out, parallel-inserial-out, parallel-in-parallel out

11.2. Universal shift register, shift register counter and applications of shift registers

LIST OF PRACTICALS

1. Study of logic breadboard with verification of truth table for AND, OR, NOT, NAND, EX-OR, NOR gate
2. Verification of NAND and NOR gate as universal gates
3. Construction of half-adder and full adder circuits using EX-OR and NAND gate and verification of their operation
4. Verify the operation of

i. Multiplexer using an IC
ii. De-multiplexer using an IC

5. a) Verify the operation of BCD to decimal decoder using an IC

   b) Verify the operation of BCD to 7 segment decoder using an IC
6. Verify operation of SR, JK, D-flip-flop master slave JK filp-flop using IC
7. Verify operation of SISO, PISO, SIPO, PIPO shift register (universal shift register)
8. Study of ring counter, Up/down counter
9. Construct and verify the operation of an asynchronous binary decade counter using JK flipflop
10. Verification of truth tables and study the operation of tristate buffer IC 74126 or similar IC and construction of 4/8 bit bi-directional bus by using an IC
11. Testing of digital ICs using IC tester

RECOMMENDED BOOKS

1. Digital Electronics and Applications by Malvino Leach, Tata McGral Hill, New Delhi
2. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall
4. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
5. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
6. Digital Electronics by Rajiv Sapra, Ishan Publication, Ambala
7. Digital Electronics by BR Gupta, Dhanpat Rai & Co., New Delhi
8. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
9. Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi

Computer Programming and Applications

EG2107 CT

Total: 6 hours/week

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

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This course deals with the fundamentals of computer Programming. The student will learn the effective use of the C programming language syntax to develop special programs, and provide I/O control for special applications.

Course Objectives:

After completing this course the student will be able to:

1. Know the basic skills needed in programming
2. Be able to write, compile, debug and run a program in C
3. Understand the uses of all data types in C
4. Understand the use of functions and write functions in C
5. Be able to use different control structures
6. Be able to use Arrays, Strings and Pointers in their programs
7. Be able to use input/output statements in a program.
8. Be able to read/write/search in a file through a C program.

Course Contents:

Unit 1. Introduction to Computer Program [3]

- 1.1 What is a program?
- 1.2 What is a programming language?
- 1.3 Steps in Programming
- 1.4 Fundamentals of a Programming Language
- 1.5 Different Programming Techniques
  - Procedural Programming
  - Modular Programming
  - Object Oriented Programming

Unit 2. Problem Solving Using Computer [2]

- 2.1 Problem Analysis
- 2.2 Algorithm Development and Flowcharts
- 2.3 Coding
- 2.4 Compilation and Execution
- 2.5 Debugging and Testing
- 2.6 Program Documentation

Unit 3. Introduction to C [5]

- 3.1 Words and Sentences in C language
- 3.2 Alphabets in C
- 3.3 Keywords in C
- 3.4 Rules of forming Words in C language
- 3.5 Data Variables, Data Types and Rules for naming and declaring data variables
- 3.6 Constants
- 3.7 Comments in C

3.8 Enumerated Data Types
3.9 Arithmetic Expressions
3.10 Concepts of Header files and Preprocessors

Unit 4. Input and Output [3]

4.1 Formatted I/O
4.2 Character I/O
4.3 Programming Using I/O

Unit 5. Flow Control Instructions [4]

5.1 Decision Control Instructions
- If
- If-else
- If-else-if
- Nested if-else
- Conditions

5.2 Loop Control Instructions
- For Loop
- While Loop
- Do While

5.3 Selection Instructions

Unit 6. Functions [5]

6.1 Why use Functions?
6.2 Components of Function
- Name of a function
- Body of a function
- Local variables of a function
- Parameters or Arguments to a function
- Return Values
- Prototype of a function

6.3 Rules of using a function

Unit 7. Array [4]

7.1 What is an array?
7.2 Array Declaration
7.3 Array Initialization
7.4 Accessing individual elements of an array
7.5 Two Dimensional Arrays
7.6 Accessing the elements of a two dimensional array
7.7 Passing an array element to a function
7.8 Rules of using an array

Unit 8. Pointers [5]

8.1 What is a pointer?
8.2 Declaring a Pointer variable
8.3 Initializing a pointer variable
8.4 Using a Pointer Variable
8.5 Pointer Arithmetic
8.6 Why use pointers
- As function arguments (By reference)
- Pointers and array
- Passing an entire array to a function

- Functions returning a Pointer Variable

Unit 9. Strings **[4]**

9.1 What are strings?
9.2 String I/O
9.3 String Manipulation Functions

Unit 10.Structures **[4]**

10.1 Declaring and Accessing Structure
10.2 Variables Uses of Structures

Unit 11 Filing **[4]**

11.1 File Pointer
11.2 Opening a File
11.3 Closing a File
11.4 Seeking in a file

Unit 12.Some Examples of Different systems Applications **[2]**

12.1 Various Applications of computer Program
- Applications in Banking
- Library Management System
- Graphics/Gaming

LIST OF PRACTICALS

1. Programming exercise on executing a C Programs.
2. Programming exercise on editing a C program.
3. Programming exercise on defining variables and assigning values tovariables
4. Programming exercise on arithmetic and relation operators
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming exercise on reading a character
7. Programming exercise on writing a character
8. Programming exercise on formatting input using print
9. Programming exercise on formatting output using scan
10. Programming exercise on simple IF statement
11. Programming exercise on IF… ELSE statement
12. Programming exercise on SWITCH statement
13. Programming exercise on GOTO statement
14. Programming exercise on DO-WHILE statement
15. Programming exercise on FOR statement
16. Programming exercise on one dimensional arrays
17. Programming exercise on two dimensional arrays
18. Demonstration of Application software to Electronics and communication Engineering branch such as: MATLAB, PSIM, MULTISIM, etc.

RECOMMENDED BOOKS

1. Brian W. Keringhan and Dennis M. Ritchie, " The C Programming Language" PHI
2. V. Rajaraman, "Computer Programming in C" PHI
3. Byron S. Gottfried, "Programming with C" McGraw Hill
4. Stephen G. Kochan "Programming in C", CBS Publishers and distributors
5. Kelly and Pohl, "A book on C" , Benjamin/Cummings

Electrical Installation

EG 2107 EE

Total: 4 hours/week

Year: II **Lecture: hours/week**

Semester: I **Tutorial: hours/week**

Practical: 4 hours/week

Course Description:

This course deals with identification, selection of cable for lighting circuit from supply intake to light and power as well as pump motors and connection procedures of these equipment and accessories.

Course Objectives:

After completing this course students will able to:

1. Identify and proper use of wiring accessories and fittings.
2. Apply wiring regulation and reduce electrical risks
3. Select and use proper size of cable, fittings and accessories
4. Read and interpret electrical layout, wiring and schematic diagrams.
5. Install, inspect, test single phase wiring circuit.

Course Contents:

In all the units mentioned below, the related theory has to be covered in the laboratory before performing the practical exercises.

Unit 1. Electrical safety, single phase supply voltage, insulation resistance, electrical shock safety rules, safety devices and practice, removal of casualties and artificial respiration [1]

Practical **[3]**

(a) Stripping of stranded wire, flexible wire, unarmoured and armoured single and multicore cables splicing, forming, soldering, straight and eyelet forming and cable shoe fitting.

Unit 2. Cable, wires, sizes, materials type, current carrying capacity cable selection [1]

Practical **[3]**

a) Connect 3 pin 13 or 15 amp plug and 3 pin 13 or 15 amp socket across the 3 core 2.5mm^2 flexible cable.
b) Connect 2 pin plug and a pendenent holder across twin flexible cable 1.5 mm^2
c) Check continuity of wires and test extension cord and table lamp connection

Unit 3. Tools and equipment, identification and selection of electrical tools, proper handling, use and care. [1]

Practical **[3]**

(a) Installation of call bell controlled from single station.

Unit 4. Single phase service intake system main cable- main switch- kilowatt hour meter – distribution board – light load- power load. [1]

Practical **[3]**

(a) Installation of one light control by one single pole switch using PVC batten- read circuit diagram and install as per lay out diagram.

Unit 5. Wiring accessories and fixtures, different types of switch, light and power sockets, lamp fittings, distribution board, junction boxes. [1]

Practical **[3]**

(a) Installation of two lamps conrol by one simple switch using PVC batten, once in series connection then in parallel connection – observe the difference.

Unit 6. Protective devices, fuses, MCB, MCCB, types rating and use, earthing system, earthing procedure, selection and importance. [1]

Practical **[3]**

(a) Installation of two lamps control by two gang simple switch and a light socket.

Unit 7. Wiring regulation , insulation resistace, earth resistance, light and power circuits [1]

Practical **[3]**

(a) Installation of one lamp controlled by, two station using alternate switch (two way connection).

Unit 8. Study of alternate switch connection by different method. [1]

Practical **[3]**

Installation of two way lighting using second method.

Unit 9. Connection method of stair case corridor, gate, compound and street light point with different controls. [1]

Practical **[3]**

(a) Installation of two lamps using alternate and intermediate switches.

Unit 10. Flourescent tube, choke, starter, capacitor, connection and working principle. [1]

Practical **[3]**

(a) Installation of one tube light control by one switch and one power socket.

Unit 11. Distribution board, incomer, Busbar out going, type and size of DB'S. [1]

Practical **[3]**

(a) Insulation of 6 ways DB and assembling of DPMCB, < SP MCBS, Kilowatt hour meter.

Unit 12. Generator, UPS, Inverter back up system and its application in house wiring fully or partly. [1]

Practical **[3]**

(a) Identify, test and install manual change over system.

Unit 13. Single phase capacitor motor centrifugal switch running capacitor, starting capacitor and its use. [1]

Practical **[3]**

(a) Installation of single phase pump motor using double pole switch prime the pump and test run.

Unit 14. Earthing – Earth plate, rod, earth, electrode, salt, charcoal watering. [1]

Practical **[3]**

(a) Demonstrate the procedure of erthing

Unit 15. 15.Testing installation, polarity continuity test, insulation test, earth resistance test, earth continuity test, of phase and neutral wire [1]

Practical **[3]**

(a) Use insulation tester earth resistance tester ohmmeter to carryout the test of new installation and prepare test certificate.

RECOMMENDED BOOKS

1 Electrical wiring fundamental -Folay

1. Electrical installation and workshop practice - F.G. Thomson
2. Electrical installation – estimating and costing - J.B. Gupta

Network, Filters and Transmission Lines

EG2108EE

Total: 6 hours/week

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

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Course Description:

The course deals with two port, symmetrical and asymmetrical electrical networks; communication filters and transmission lines theory

Course Objectives:

After completing this course the students will be able to:

1. learn the characteristics principle of transmission lines particularly in high frequency
2. understand the use of transmission of plane electromagnetic waves in bounded media

Course contents:

Unit 1: Networks **[9]**

1.1 Two Port (Four Terminal) Network

- Two port parameters (impedance, admittance, transmission, hybrid parameters)
- Interconnection of two ports (series connection, parallel connection, cascade connection
- Equivalent networks
- T-network, Pi-networks, ladder networks
- Symmetrical and asymmetrical networks

1.2 Symmetrical Network

- Concept and significance of characteristic impedance, propagation constant, attenuation constant (with expression in terms of Zo, Zoc for Tnetwork, Pi-network

1.3 Asymmetrical Network

- Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss
- Half section (L-section), symmetrical T and Pi section into half section

Unit 2: Network Theorem **[8]**

2.1 A brief study of following:

- Tellegen's Theorem
- Superposition theorem
- Substitution theorem
- Thevenin and Norton theorem
- Reciprocity – maximum power transfer theorem
- Attenuators: brief idea about attenuators and its types

Unit 3: Filters **[12]**

3.1 Applications of filters in communication system

- Concept of low pass, high pass, band pass, band stop, butter worth filter, constant filters, m-derived filters, K-filters

3.2 Proto-type Filter Section

- Reactance vs attenuation constant and characteristic of a low pass filter and its impedance
- Attenuation vs frequency, phase shift vs frequency characteristics
- Impedance vs frequency of T and Pi curve and their significance

3.3 M-derrived Filter Section

- Need of M-derived filters
- Expression for m in terms of fc (cut off frequency) fw (Frequency at which attenuation is infinity) for low pass and high pass filter

3.4 Active Filters

- Basic concept and comparison with passive filters
- Simple problems onlow pass and high pass filters (first and second order)

Unit 4: Transmission Lines **[16]**

4.1. Transmission lines and their implications, shapes of different types of transmission lines, (including 300 ohms antenna feeder cable, 75 ohm coaxial cable)

4.2. Distributed (or primary) constant of a transmission line, equivalent circuit of an infinite line, T and Pi type representation of a section of transmission line

4.3. Definition of characteristics impedance line: concept of short line termination in Zo; currents and voltage along at infinite line, propagation constant attenuation and phase shift constant of the line

4.4. Relationship of characteristics impedance, propagation constant attenuation constant and phase constant in terms of distributed constants of the lines.

4.5. Conditions for minimum distortion and minimum attenuation signal on the line; necessity and different methods of loading the communication lines (no derivation)

4.6. Concept of reflection and standing waves on a transmission lines; definition of reflection coefficient in terms of characteristic impedance and load impedance, definition of standing wave ratio (SWR). Relation between VSWR and voltage reflection coefficient maximum impedance and VSWR

4.7. Transmission line equation; expressions for voltage current and impedance at a point on the line for lines with and without losses

4.8. Input impedance of an open and short circuited line and its graphical representation

4.9. Transmission Line. at high frequency, effect of high frequencies on the losses of a transmission line; application of Transmission Line as a reactive component and impedance transformer (e.f. quarter wave transformer)

4.10. Principle of impedance matching using single stub; comparison of open and short circuit

Note: No derivation of any formula

LIST OF PRACTICALS

1. Measurement of characteristics impedance of a symmetrical Pi and T networks
2. Image impedance of a given asymmetrical Pi and T networks
3. Determine experimently the characteristics impedance of a prototype
   - Low pass filters
   - High pass filter and plot attenuation characteristics
4. To design and measure the attenuation of a symmetrical T/Pi type attenuation
5. To plot the impedance characteristics of a prototype band-pass filter and also plot the attenuation characteristics of band pass filter
6. To plot the impedance characteristics of m-derived low pass filter
7. To plot the attenuation characteristics of a m-derived high pass filter
8. To assemble test the following butter worths active filter:
   - First order low pass and high pass
   - Second order low pass and high pass
9. Measurement of characteristics impedance propagation constant, VSWR for a given T.L. (transmission line)

RECOMMENDED BOOKS

1. Network Lines and Fields by John D Ryder; PHI, New Delhi
2. Network Filters and Transmission Lines by AK Chakarvortgy; Dhanpat Rai & Co. Publication
3. Network Analysis by Van Valkenburg: PHI, New Delhi
4. Network Analysis by Soni and Gupta; Dhanpat Rai & Co. Publication
5. Network Theory and Filter Design by Vasudev K. Aatre

Electronics Components and Materials

EG 2109 EX

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

Course Description:
This course deals with materials and their classification and components related to electronics engineering. It also imparts the identification, characteristics, specifications, merits, limitations, and applications of electronic components and materials.

Course Objectives:
After completing this course students will able to:
1. Identify and expalin the different materials, their poperties and applications.
2. Identify and explain different types of electronics components.

Course Contents:

Unit 1: Materials **[22]**

1.1 Classification of materials [3]
- Conducting, semi-conducting and insulating materials through a brief reference to their atomic structure.

1.2 Conducting Materials [6]
- Resistors and factors affecting resistivity such as temperature, alloying and mechanical stressing.
- Classification of conducting materials into low resistivity and high resistivity materials.

1.3 Insulating Materials [6]
- Important relevant characteristics (electrical, mechanical and thermal) and
- Applications of the following material: Mica, Glass, Copper, Sliver, PVC, Silicon, Rubber, Bakelite, Cotton, Ceramic, Polyester, Polythene and Varnish.

1.4 Magnetic Materials [7]
- Different Magnetic materials; (Dia, Para, Ferro) and their properties.
- Ferro magnetism, Domains, permeability, Hysteresis loop.
- Soft and hard magnetic materials, their examples and typical applications.

Unit 2: Components **[23]**

2.1 Capacitors [5]
- Concept of capacitance and capacitors, units of capacitance, types of capacitors, constructional details and testing specifications
- Capacity of parallel plate capacitors, spherical capacitors, cylindrical capacitor.
- Energy stored in a capacitor.

- Concept of di-electric and its effects on capacitance, di-electric constant, break down voltage.
- Series and parallel combination of capacitor. Simple numerical problems of capacitor.
- Charging and discharging of capacitor with different resistances in circuit, concept of current growth and decay, time constant in R-C circuits, simple problems.

2.2 Resistors: [3]

- Carbon film, metal film, carbon composition, wound and variable types (presets and potentio-meters)

2.3 Transformer, inductors and RF coils: [3]

- Methods of manufacture, testing, Need of shielding, application and trouble shooting

2.4 Surface Mounted Devices (SMDs): [3]

- Constructional detail and specifications.

2.5 Connectors, Relays, switches and cables: [3]

- Different types of connectors, relays, switches and cables, their symbols, construction and characteristics.

2.6 Semi Conductors and Integrated Circuits [6]

- Basic characteristics of Semiconductor materials, testing of diodes, transistors, FETs and SCRs.
- Various processes used in IC manufacturing. Hybrid IC technology.
- Introduction to Superconductivity and piezoelectric transducer elements

RECOMMENDED BOOKS

1. Electronic Components and Materials by Grover and Jamwal; Dhanpat Rai and Sons, New Delhi
2. Basic Electronics and Linear Circuits by NN Bhargava and Kulshreshta; Tata McGraw Hill, New Delhi
3. Electronic components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
4. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
5. Electronic Engineering Materials by ML Gupta, Dhanpat Rai and Sons; New Delhi.

Fourth Semester

Subjects:

EG 2201 EX	**Principle of Communication Engineering**
EG 2203 EX	**Introduction to Microprocessors**
EG 2204 EX	**Electronic Instruments & Measurements**
EG 2206 EX	**Digital Electronics II**
EG 2207 EX	**Industrial Electronics**
EG 2209 EX	**Instrumentation and PLC**
EG 2210 EX	**Electronic Fabrication Techniques**

Principles of Communication Engeering

EG2201EX

Total: 7 hours/week
Year: II **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course Description:
This course deals with the basic fundamentals of communication engineering.

Course Objectivs:
After completing this course, the students will be able to:
1. Explain principles and characteristics of communication services/systems
2. Understand principles and necessity of signal modulation in information transmission
3. Understand principles of various modulation techniques
4. Explain working principles, characteristics and applications of different types of modulators and demodulators

Course Contents:

Unit 1. Introduction: [5]
- 1.1. History of communication
- 1.2. Modulation, Need for modulation and demodulation in communication systems
- 1.3. Analog communication system: definition, block diagram
- 1.4. Electromagnetic spectrum and its various ranges: VLF, LF, MF, HF, VHF, UHF etc.
- 1.5. Communication channel: definition, types (wire, wireless),examples
- 1.6. Noise in communication: definition, types(external ,internal)

Unit 2. Amplitude Modulation: [6]
- 2.1 DSB-AM: Derivation of expression for an amplitude modulated wave. Carrier and side band components. Modulation index. Spectrum and Bandwidth of AM Wave. Relative power distribution in carrier and side bands. characteristics, applications
- 2.2 Elementary idea of DSB-SC, SSB, ISB and VSB modulations, their comparison and areas of applications.

Unit 3. Frequency Modulation: [6]
- 3.1 Definition, principle, characteristics, applications
- 3.2 Stereo FM (introduction only)
- 3.3 Expression for frequency modulated wave and its frequency spectrum (without Proof and analysis of Bessel function), Modulation index, maximum frequency deviation, BW of FM signals, Carson's rule.
- 3.4 Comparison of FM and AM in communication systems

Unit 4. Phase modulation: [6]
- 4.1. Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation.
- 4.2. Generation of FM wave using Phase modulator; generation of PM wave using frequency modulator (block diagrams)

Unit 5. Principles of Amplitude Modulators: [8]

5.1 Working Principles and typical applications of
- Square law Modulator
- Base modulator
- Collector modulator
- Ring Modulator
- Balanced Modulator

Unit 6. Principles of Frequency Modulators: [6]

6.1 Working principles and applications of reactance modulator, varactor diode modulator, VCO and Armstrong phase modulator.

6.2 Stabilized Reactance modulator-AFC (Block diagram).

Unit 7. Demodulation of AM wave: [6]

7.1 Principles of demodulation of AM wave using diode detector(envelope detector) circuit; concept of Clipping and formula for RC time constant for minimum distortion (no derivation)

7.2 Principle of demodulation of AM Waves using synchronous detection.

Unit 8. Demodulation of FM wave: [8]

8.1 Basic principles of FM detection using slope detector

8.2 Working principle of the following FM demodulators: Foster-Seeley discriminator, Ratio detector, Phase locked Loop (PLL) FM demodulators

8.3 Effects of noise on FM carrier-Noise triangle, Role of limiter, Need for pre-emphasis and de- emphasis

Unit 9. Pulse Modulation: [9]

9.1 Electrical representation of binary data (unipolar, polar, bipolar signaling etc.)

9.2 Statement of sampling theorem; Nyquist rate, Nyquist interval

9.3 Basic ideas about PAM, PPM, PWM

9.4 Pulse code Modulation (PCM)
- Quantisation and quantisation error
- Block diagram of TDM-PCM communication system and function of each block
- Advantages of PCM systems
- Concepts of differential PCM (DPCM)
- Delta Modulation (DM)
- Basic principle of delta modulation system
- Advantages of delta modulation over PCM system
- Limitations of delta modulation
- Concept of adaptive delta modulation (ADM)

LIST OF PRACTICALS

1. To observe amplitude modulated wave for different modulating signals and measure the modulation index of the wave obtained.
2. To generate a DSB-SC signal and observe the pattern on CRO for different levels of modulating signal.
3. To observe FM wave using VCO circuit for different modulating signals.
4. To obtain modulating signal from an AM detector (envelope detector). Observe the pattern for different RC time constant. (See diagonal clipping, negative peak clipping).
5. To obtain modulating signal from a FM detector.
6. To observe the characteristics of pre emphasis and de emphasis circuits.

7. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output.
8. To verify the sampling theorem
9. To observe and note the pulse modulated signals (PAM, PPM, PWM) and compare them with the corresponding analog input signal
10. To measure the Quantization noise in a 3 bit/4 bit coded PCM signal
11. To feed an analog signal to a PCM modulator and compare the demodulated signal with the analog input. Also note the effect of low pass filter at the demodulated output.
12. To study the process of delta modulation.

RECOMMENDED BOOKS

1. Electronic Communication Systems, by G. Kennedy and B. Davis, Tata McGraw-Hill, New Delhi
2. Electronic Communications, by D.Roddy & J. Coolen
3. Communication Systems, by Sanjay Sharma, -S.K. Kataria and sons
4. Principles of Communication Engineering by Anokh Singh, S.Chand & Co., New Delhi
5. An Introduction to analog and digital communications, by Simon Haykin. , John Wiley and Sons.
6. Radio Engineering by G.K. Mittal , Khanna Publishers, New Delhi
7. Electronics Communication by KS Jamwal, Dhanpat Rai & Sons, New Delhi
8. Latest Publications on the subject

Introduction to Microprocessors

EG2203EX

Total: 6 hours/week

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

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This course deals with fundamentals of microprocessor, basic low level microprocessor programming, interfacing and introduction to basic programmable devices.

Course Objectives:

After completing this course the students will be able to

1. Understand the working principle of microprocessor
2. Understand the process of writing and executing low level language
3. Know how to interface devices with a computer

Course Contents:

Unit1. Introduction to Microprocessor [4]

1.1. Microprocessor, microcomputer, microcontroller
1.2. Block diagram of a typical microprocessor and microcontroller
1.3. General architecture of a microcomputer system showing control buses

Unit2. Microprocessor architecture and the instruction set [8]

2.1. Internal architecture of 8085 microprocessor
2.2. Instruction and data formats
2.3. Instruction classifications
2.4. 8085 Instruction set
2.5. Addressing modes in 8085

Unit3. Assembly language programming for 8085 [9]

3.1. Introduction to assembly language and assemblers
3.2. Simple assembly language programs
3.3. Programs using loops, counters, delays
3.4. Table processing
3.5. Subroutine and stack
3.6. Code conversion ASCII/BCD/Binary

Unit4. Interfacing I/O and memory devices [8]

4.1. 8085 machine cycles and bus timing
- Fetch and execute cycles
- Memory read/write machine cycle
- I/O read/write machine cycle

4.2. Address Decoding
- Unique and non-unique address decoding
- Address decoding for I/O and memory devices

4.3. Interfacing I/O devices
- Interfacing Input Devices
- Interfacing Output Devices

- Address decoding using block decoders
- Interfacing Memory-mapped I/O

4.4. Memory Interfacing
- Memory structure and its requirement
- RAM and ROM chips
- Address decoding using NAND and block decoders

4.5. Direct memory access

Unit5. 8085 Interrupt processing [6]

5.1. Programmed I/O
5.2. Interrupt Driven I/O
5.3. The 8085 Interrupt
5.4. 8085 Vectored Interrupts
5.5. Restart and software instructions

Unit6. Introduction to general purpose programmable [6]

6.1. 8255 Programmable Peripheral Interface:
6.2. 8254(8253) Programmable Interval Timer:
6.3. 8259 Programmable Interrupt Controller
6.4. 8251 USART

Unit7 Advanced Microprocessors [4]

7.1. Architecture of 8086 microprocessors
7.2. Addressing modes and programming features
7.3. Comparison with 8085 microprocessor

LIST OF PRACTICALS

The practical exercise shall cover the low level program from simple programs for data transfer to complex programs for table processing

1. Basics of microcomputer system through the 8085 microprocessor trainer kit
2. Programs that uses data transfer instructions
3. Programs that uses arithmetic instructions
4. Programs that uses logical instructions
5. Programs with conditional and unconditional branching
6. Programs with conditional and unconditional subroutine call and stack
7. Programs involving loops and counters
8. Programs that involves masking and checking numbers
9. Programs to manipulate table of numbers
10. Program for BCD and ASCII manipulation
11. Programs to perform multiplication and division
12. Programs to read and write from the port

RECOMMENDED BOOKS

1. Amesh S. Gaonkar, “8085 Microprocessor programming and interfacing”, New Age
2. John Uffenbeck, “The 8080, 8085 & Z-80 Programming, Interfacing and Troubleshooting”, PHI
3. Albert Paul Malvino, Jerald A. Brown, “Digital Computer Electronics”, McGraw-Hill

Electronic Instruments and Measurement

EG2204EX

Total: 6 hours/week

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

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This course deals with fundamentals of measurement and instrumentation, measurements of signal and Calibration, Errors, Signal conditioning and data acquisition system.

Course Objective

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

1. To provide knowledge of measurements.
2. To gain the knowledge of working principles and operation of different instruments.
3. To handle wide variety of instruments while testing, trouble shooting, and calibration.

Course content

Unit 1: Basics of Measurements **[5]**

- 1.1 Measurement, method of measurement, types of instruments
- 1.2 Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors loading effect,
- 1.3 Requirements, importance and applications of standards, calibration

Unit 2: Multimeter **[6]**

- 2.1 Principles of measurement of DC voltage, DC current, AC voltage, AC current,
- 2.2 moving coil and moving iron type instruments (voltmeter and Ammeter),
- 2.3 Block diagram of multimeter and measurement of voltage,
- 2.4 current and resistance using multimeter
- 2.5 Specifications of multimeter and their applications,
- 2.6 Limitations with regard to frequency and input impedance

Unit 3: Electronic Voltmeter **[4]**

- 3.1 Advantages over conventional multimeter for volt measurement with respect to input impedance and sensitivity,
- 3.2 Principles of voltage, current and resistance measurement (block diagram only),
- 3.3 Specifications of electronic voltmeter

Unit 4: AC Milli Voltmeter **[3]**

- 4.1. Types of AC milli voltmeters and their block diagram description,
- 4.2. Typical specifications and their significance

Unit 5: Cathode Ray Oscilloscope **[6]**

- 5.1. Construction and working of different blocks used in CRT,
- 5.2. Time base operation and need for blanking during flyback, synchronization ,
- 5.3. Block diagram description of a basic CRO and triggered sweep oscilloscope,front panel controls,
- 5.4. Specifications of CRO and their explanation,

5.5. Measurement of current, voltage, frequency,
5.6. Time period and phase using CRO CRO probes,
5.7. Special features of dual beam, dual trace,delay sweep
5.8. Digital storage oscilloscope: block diagram and working principle

Unit 6: Signal Generators and Analysis Instruments [5]

6.1. Explanation of block diagram specifications of low frequency and RF generators,
6.2. pulse generator, function generator, Distortion factor meter; wave analyser

Unit 7: Impedance Bridges and Q Meters [6]

7.1. Wheat stone bridge
7.2. AC bridges: Maxwell's induction bridge, Hay's bridge, De-Sauty's bridge and Schering Bridge
7.3. Block diagram and working principle of Q meter and its specifications.

Unit 8: Digital Instruments [6]

8.1. Comparison of analog and digital instruments ,
8.2. Working principle of ramp and integration type digital voltmeter,
8.3. Block diagram and working of a digital multimeter ,
8.4. Measurement of time interval, time period and frequency using universal counter/frequency counter,
8.5. Brief working principle of logic probe, logic pulser, logic analyzer.

Unit 9: Measurement of Power [4]

9.1. Measurement of power using voltmeter & ammeter
9.2. Wattmeter (dynamo type) Brief operation and application
9.3. Energy meter (Kwh meter) Operation & application

LIST OF PRACTICALS

1. To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance
2. To observe the limitations of a multimeter for measuring high frequency voltage
3. Measurement of voltage, frequency, time period and phase using CRO
4. Measurement of rise time and fall time using CRO
5. Measurement of Q of a coil and its dependence on frequency
6. Measurement of voltage, frequency, time and phase using DSO
7. Measurement of resistance and inductance of coil using RLC Bridge
8. Measurement of distortion of RF signal generator using distortion factor meter
9. Use of logic pulser and logic probe
10. Measurement of time period, frequency, average period using universal counter/ frequency counter

RECOMMENDED BOOKS

1. Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai andSons, New Delhi
2. Electronics Instrumentation by Cooper, Prentice Hall of India, New Delhi
3. Electronics Test and Instrumentation by Rajiv Sapra, Ishan Publications, Ambala
4. Electronics Instrumentation by JB Gupta, Satya Prakashan, New Delhi

Digital Electronics II

EG2206EX

Total: 6 hours/week

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

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This course deals with the study, design and application of digital devices that are based on various logic families.

Course Objectives:

After completing this course the students will be able to

1. Explain various logic families,
2. Design different logic concept and circuits.

Course Contents:

Unit 1: Logic Families [8]

1.1 Logic family classification. TTL, ECL, MOS, CMOS. Types of integration SSI, MSI, LSI, VLSI

1.2 Characteristics of TTL and CMOS and the comparison. Propagation delay. Speed, noise margin. Logic levels, power dissipation, fan-in, fan-out, power supply requirements

1.3 Open collector and totem pole output circuits, operation of a standard TTL,CMOS, NAND, NOR gates

1.4 CMOS to TTL interfacing and TTL to CMOS interfacing LAMP/LED interfacting

1.5 Introduction to tri-state devices tri-state buffer and invertor circuits. Examples of unidirectional and bi-directional bus with tri-state interfacing.

Unit 2: A/D and D/A Converters [8]

2.1 DA Converters: Performance characteristics of D/A converters, binary resister network and resistance ladder network methods of D/A converters and applications

2.2 A/D Converters: Performance characteristics of A/D converters, single slope, dual slope, successive approximation and parallel A/D converters

Unit 3: Memories [10]

3.1 Memory organisation, classification of semi conductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory. CCD memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA), familiarization with common ICs.

Unit 4: Combinational Circuits [7]

4.1. Minimisation of Boolean expressions using

- K-map method,
- tabular method of function minimization,
- Quine Mcclskey method

Unit 5: Sequential Circuits [8]

5.1. Essential components of sequential circuit,
5.2. Synchronous and asynchronous sequential circuits,
5.3. Classification of sequential circuits (Meely and Moore Machine),
5.4. Design of counters using J-K and R-S flip-flops.

Unit 6: Arithmetic and Logic Unit **[4]**

6.1. Basic idea about arithmetic logic unit w.r.t. IC 74181 and applications,
6.2. Implementation of binary multiplication, division, subtraction and addition

LIST OF PRACTICALS

1. Verify the operation of D/A converter
2. Verify the operation of A/D converter
3. Verify the writing and reading operation of RAM IC
4. Design J-K Flip-flop counter and verify its truth table
5. Familiarity with the use of EPROM programmes and UV index
6. Exercise on programming of EPROM
7. Using PLA design and implement a combinational circuit like full adder
8. Design and implement full adder and full subtractor
9. Verify the logical operation, arithmetic operation of binary numbers using IC741981
10. Design of combination circuit using ROM

RECOMMENDED BOOKS

1. Digital Systems and Applications by RJ Tocci, Prentice Hall of India, New Delhi
2. Digital Electronics by RP Jain, Tata McGraw Hill, New Delhi
3. Digital Electronics by KS Jamwal, Dhanpat Rai & Co., New Delhi
4. Digital Logic Designs by Morris Mano, Prentice Hall of India, New Delhi
5. Digital Designs by CJ Roth, Jaico Publication
6. Digital Designs by Z Kohavi
7. Digital Electronics by Terry LM Bartlet
8. Digital Electronics by Rajaraman V, Prentice Hall of India, New Delhi
9. Digital Fundamentals by Malvino and Leachy, Tata McGraw Hill Publishers, New Delhi
10. Digital Systems by Sanjay K Bose, Wiley Eastern (P) Ltd., New Delhi

Industrial Electronics

EG2207EX

Total: 6 hours/week

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

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course Description:

This course covers solid-state elements of industrial control including Triacs, SCRs and triggering devices, computer control issues, industrial applications of electronics and other control devices.

Course Objectives:

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

1. Explain the importance of of power electronic equipment used in process control Industry.
2. Explain the principle of industrial control.
3. Explore electronic devices used in industrial control.
4. Explore industrial controls from a systems approach

Course Contents:

Unit 1: Introduction to thyristors and other Power Electronics Devices [12]

- 1.1 Construction, Working principles of SCR, two transistor analogy of SCR, V-I characteristics of SCR.
- 1.2 SCR specifications & ratings.
- 1.3 Different methods of SCR triggering.
- 1.4 Different commutation circuits for SCR.
- 1.5 Series & parallel operation of SCR.
- 1.6 Construction & working principle of DIAC, TRIAC & their VI characteristics.
- 1.7 Construction, working principle of UJT, V-I characteristics of UJT. UJT as relaxation oscillator.
- 1.8 Brief introduction to Gate Turn off thyristor (GTO), Programmable uni-junction transistor (PUT), MOSFET.
- 1.9 Basic idea about the selection of Heat sink for thyristors.
- 1.10 Application such as light intensity control, speed control of universal motors, fan regulator, battery charger.

Unit 2: Controlled Rectifiers [6]

- 2.1 Single phase half wave controlled rectifier with load (R, R-L)
- 2.2 Single phase half controlled full wave rectifier (R, R-L)
- 2.3 Fully controlled full wave bridge rectifier.
- 2.4 Single phase full wave centre tap rectifier.

Unit 3: Inverters, Choppers, Dual Converters and Cyclo converters. [12]

- 3.1 Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel. Inverters & their applications.
- 3.2 Choppers: Introduction, types of choppers (Class A, Class B, Class (C and Class D). Step up and step down choppers.

3.3 Dual Converters and cyclo converters: Introduction, types & basic working principle of dual converters and cyclo converters & their applications.

Unit 4: Thyristorised Control of Electric drives [10]

3.1 DC drive control

- Half wave drives.
- Full wave drives
- Chopper drives (Speed control of DC motor using choppers)

3.2 AC drive control

- Phase control
- Constant V/F operation
- Cycloconverter/Inverter drives.

Unit 5: Uninterrupted Power supplies [5]

5.1. UPS, on-line, off line & its specifications

5.2. Concept of high voltage DC transmission

5.3. Idea of SMPS

LIST OF PRACTICALS

1. Plot VI characteristic of an SCR.
2. Plot VI characteristics of TRIAC.
3. Plot VI characteristics of UJT.
4. Plot VI characteristics of DIAC.
5. Study of UJT relaxation oscillator. And observe I/P and O/P wave forms
6. Observation of wave shape of voltage at relevant point of single-phase half wave controlled rectifier and effect of change of firing angle.
7. Observation of wave shapes of voltage at relevant point of single phase full wave controlled rectifier and effect of change of firing angle.
8. Observation of wave shapes and measurement of voltage at relevant points in TRIAC based AC phase control circuit.
9. Varying lamp intensity and AC fan speed control.
10. Installation of UPS system and routine maintenance of batteries.
11. Speed control of motor using SCRs

RECOMMENDED BOOKS

1. Power Electronics by P.C. Sen Tata Mc Graw Hill. New Delhi
2. Power Electronics by P.S. Bhimbhra, Khanna Publishers, New Delhi
3. Power Electronics by M.S. Berde, Khanna Publishers, New Delhi.
4. Power Electronics by MH Rashid
5. Industrial Electronics and Control by SK Bhattacharya and S. Chatterji, New Age Publications. New Delhi

Instrumentation and PLC

EG2209EX

Total: 6 hours/week

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

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. The course includes the measurement of parameters most commonly used in industry like motion, flow, force, torque, temperature, pressure etc. used in control system.

Course Objectives:

On completion of this course, the students will be able to

1. Familiarize various types of measurement techniques in industry for motion, length, temperature, pressure, density etc.
2. Know different types of control devices and control mechanisms used in instrumentation.

Course Contents:

Unit 1: Fundamentals of Measurement and control: [6]

1.1 Importance of instrumentation, basic measuring and instrumentation systems, advantages and limitations of each systems, Basic elements of control systems, control system terminology

1.2 Functional block diagram of a control system, Open loop and closed loop control systems, manually controlled closed loop systems and automatic controlled closed loop systems. Examples of automatic control systems

Unit 2: Transducers: [4]

2.1 Theory, construction and use of various transducers (resistance, inductance, capacitance, electromagnetic, piezo electric type)

Unit 3: Measurement of Displacement and Strain: [4]

3.1 Displacement Measuring Devices: wire wound potentiometer, LVDT, strain gauges and their different types such as inductance type, resistive type, wire and foil type etc. Gauge factor, gauge materials and their selections. Use of electrical strain gauges.

Unit 4: Force and Torque Measurement: [5]

4.1. Different types of force measuring devices and their principles, load measurements by using elastic transducers and electrical strain gauges. Load cells, measurements of torque by brake, dynamometer, electrical strain gauges,

Unit 5: Pressure Measurement: [4]

5.1. Bourdon pressure gauges, electrical pressure pick ups and their principle, construction and applications. Use of pressure cells.

Unit 6: Flow Measurement: [2]

6.1. Basic principles of magnetic and ultrasonic flow meters.

Unit 7: Measurement of Temperature: [3]

7.1. Brief description of bimetallic thermometer, thermoelectric thermometer, resistance thermometer, thermocouple, thermisters and pyrometer.

Unit 8: Introduction and Working of PLC [5]

8.1. PLC, limitations of relays. Advantages of PLCs over electromagnetic relays
8.2. Basic operation and principle of PLC,
8.3. Architectural details – Processor
8.4. Memory structure, I/O Structure
8.5. Programming terminal, Power Supply

Unit 9: Instruction Set [6]

9.1. Basic instructions like latch, master control self holding relays.
9.2. Timer instructions like on-delay timers, off-delay timers, retentivetimers, resetting of timers.
9.3. Counter instructions like up-counter, down counter, resetting ofcounters.
9.4. Sequencers, output sequencers, input sequencers time driven and event driven sequencers masking etc.
9.5. Comparison instruction like equal, not equal, greater, greater than equal, less than, less than equal mask equal, limit etc.

Unit 10: Ladder diagram programming [4]

10.1. Programming based on Basic instructions, timer counter, sequencer to comparison instruction using ladder diagrams.

Unit 11: Applications of PLCs [2]

10.1. Process controls
10.2. Washing machine

LIST OF PRACTICALS

1. Measure the level of a liquid using a transducer
2. Draw the characteristics of a potentiometer
3. Study and use of digital temperature controller
4. Use of themistor in ON/OFF Switch
5. Study of variable capacitive transducer
6. To measure linear displacement using LVDT
7. To study the use of electrical strain gauge
8. Familiarization with the working of PLC
9. Basic logic operations, AND, OR, NOT, functions
10. Logic control systems with time response as applied to clamping operation
11. Sequence control system e.g in lifting a device for packaging and counting
12. Writing entering and testing programs using a hand-held programmer for the following operations:
    - Ladder Logic
    - Timers
    - Counters

RECOMMENDED BOOKS

1. Electronic Measurement and Instrumentation by Dr Rajendra Prasad
2. Electronic Measurement and Instrumentation by JB Gupta, SK Kataria and Sons, New Delhi
3. Electrical and Electronics Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Co., New Delhi
4. Electronic Instrumentation and Measurement Techniques by WD Cooper, AD Helfrick Prentice Hall of India Pvt. Ltd. New Delhi
5. Industrial Instrumentation by Umesh Rathore, SK Kataria and Sons, New Delhi

Electronic Fabrication Techniques

EG2210EX

Total: 3 hours/week
Year: II **Lecture: hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:
This subject deals with the elementary design and fabrication of the PCB. The topics of assembly, soldering, testing, and documentation have been included to give overall picture of the process of manufacturing of electronic devices.

Course Objectives:
On completion of this course, the students will be able to
1. Familiarize with PCB fabrication techniques.
2. Apply different software to designelectrinic circuit.
3. Explain about the production planning and photo plating.

Course Contents:

Unit 1: **Fabrication Techniques**

1.1 Printed Circuit Boards (PCBs):
- PCB board materials, their characteristics and plating, corrosion and its prevention.
- Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multilayer PCBs.
- Standards of board sizes. Modular assemblies edge connectors, multi board racks, and flexible boards.
- Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering, solderability, composition of solder. Edge connector. Elements of wire shaping.

1.2 Production Storage and supply of components for assembly, role of incoming inspection of components, assembly line reduction, tools and jigs for lead bending. Manual and automatic insertion techniques. Closed loop assembly of modules and/or complete instruments. Specific examples of small scale and large-scale production to be given to illustrate above mentioned methods.

1.3 Testing
- Jigs and fixtures for operational testing of modules / subassemblies. Sequence testing for failure analysis. Environmental testing at elevated temperature and humidity. Vibration and mechanical endurance testing. Packing for transportation.

1.4 Documentation Statement of brief specifications, detailed specifications and limitations. Block diagram detailed diagrams. Testing and checking points. Warning relative to high voltage for handling during repair. Fault location guide. Simple solutions for fault removal

Unit 2: Computer aided design (CAD)

2.1 Computer aided design of electric circuit using different software like eagle, orcad, circuit maker.

Unit 3: Production Planning

Unit 4: CNC drilling, photo plating

LIST OF PRACTICALS

1. Preparation of PCBs (handsome and screen printed) from schematic diagram such as voltage stabilizer, regulated supply, timer and assembly of small project **[30]**
2. Computer Aided Design and Single sided and double-sided PCBs using different software like eagle, orcad, circuit maker. **[15]**

Some of the projects are listed below which is just a guideline for selecting the minor project. Students can also select any other project with the advice of instructor(s).

LIST OF PROJECTS:-

1. Regulated power supply
2. Timers using 555 and other oscillators
3. Touch plate switches – transistorized or 555 based
4. Door bell/cordless bell
5. Clapping switch and IR switch
6. Blinkers
7. Sirens and hooters
8. Single hand AM or FM
9. Electronic toy gun, walker, blinkers
10. Electronic dice
11. Cell charger, battery charger, mobile charger
12. Fire/smoke/intruder alarm
13. Liquid level controller
14. Counters
15. Combination locks
16. Electronics musical instruments
17. Telephone handset
18. Electronic Ballasts
19. Audio amplifiers
20. Tape recorders
21. Automatic stabilizer/CVT
22. Emergency light
23. Design and manufacture of transformer
24. Fan regulator

RECOMMENDED BOOKS

1. Printed circuit Board by Bosshart
2. Electronics Techniques by Rajesh Kumar, NITTTR, Chandigarh
3. Modular CAD for PCBs using EAGLE software by Rajesh Kumar, NITTTR, Chandigarh
4. Electronic Manufacturing Technology by KS Jamwal, Dhanpat Rai and Sons, New Delhi

Third Year
(Fifth and Sixth Semester)

Fifth Semester

Subjects:

EG 3101 EX	**Communication System**
EG 3102 EX	**Microwave and Radar Engineering**
EG 3103 EX	**Troubleshooting and Maintenance of Electronics Equipment**
EG 3101 CT	**Computer Networks**
EG 3108 EX	**Consumer Electronics**
EG 3101 MG	**Principle of Management and Costing**

Communication System

EG 3101EX

Total: 7 hours/week

Year: III **Lecture: 4 hours/week**

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This course deals with various communication systems, characteristics of Radio transmitters and receivers, basic principles of digital communications, basic principles, characteristics and applications of various types of antennas used in communication, propagation of signals basic principles, characteristics and applications of microwave and satellite communication systems and principles of optical fiber communication system.

Course Objectives:

After completing this course the students will be able to

1. Explain basic operation and characteristics of Radio transmitters and receivers.
2. Understand basic principles of digital communications
3. Explain basic principles of telephone communication systems
4. Explain basic principles, characteristics and applications of various types of antennas used in communication
5. Explain various modes of propagation of signals
6. Understand basic principles, characteristics and applications of microwave and satellite communication systems
7. Understand principles of optical fiber communication system

Course Contents:

Unit 1. Radio Transmitters: [8]

1.1. Classification of transmitters on the basis of modulation, service, frequency and power
1.2. Block diagram of a typical AM radio broadcasting transmitter, operation, characteristics
1.3. Block diagram of a typical SSB radio communication transmitter, operation, characteristics
1.4. Block diagram and working principles of reactance FET and Armstrong FM transmitters

Unit 2. Radio Receivers: [10]

2.1. Block diagram and working principle of superheterodyne AM receiver. Function of each block and typical waveforms at input and output of each block
2.2. SSB communication receiver: Block diagram, operation, characteristics
2.3. Performance characteristics of radio receiver: sensitivity, selectivity, S/N ratio, image rejection ratio and their measurement procedure
2.4. Selection criteria for intermediate frequency (IF)
2.5. Concepts of simple and delayed AGC
2.6. Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks.
2.7. Need for limiting and de-emphasis in FM reception
2.8. Block diagram of communication receivers, differences with respect to broadcast receivers.

Unit 3. Introduction to Digital Communication system: [8]

3.1 Basic block diagram of digital and data communication systems. Their comparison with analog communication systems.

3.2 Digital Carrier modulation: working principle of Amplitude shift keying (ASK), Frequency Shift keying (FSK) and Phase shift keying (PSK)

3.3 Basic concepts of time division multiplexing (TDM) and frequency division multiplexing (FDM)

3.4 Modem: Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems). Modem interconnection

Unit 4. Telephony: [5]

4. 1. Organization of telephone communication network

4. 2. Telephone sets: construction, basic electric diagram, operation, characteristics

4. 3. Introduction to telephone exchange switching

4. 4. Introduction to PBX, PABX and EPABX. Function of PBX. Modern PABX capabilities

Unit 5. Antennas: [8]

5. 1. Physical concept of radiation of electromagnetic energy from a dipole. Concept of polarization of EM Waves.

5. 2. Definition and physical concepts of the terms used with antennas : point source, gain directivity, radiation pattern

5. 3. Types of antennas-brief description, characteristics and typical applications of folded dipole, medium wave (mast) antenna, Yagi-Uda and ferrite rod antenna (used in transistor receivers)

5. 4. Brief description of horn antenna and dish antenna, their applications

Unit 6. Propagation: [8]

6. 1. Basic idea about different modes of wave propagation and typical areas of application. Ground (Surface) wave propagation and its characteristics

6. 2. Space wave communication – line of sight propagation

6. 3. Sky wave propagation - ionosphere and its layers. Explanation of terms - virtual height, critical frequency, skip distance, maximum usable frequency

Unit 7. Introduction to optical fiber communication: [6]

7. 1. Advantages of Fiber optic communication

7. 2. Block diagram of a fiber-optic communication link

7. 3. Optical sources: LED, laser diode

7. 4. Optical detectors: photo diode, photo transistor

7. 5. Basic idea of Fiber connection techniques

Unit 8. Introduction to Satellite communications: [4]

8.1 History, orbits

8.2 Geo-stationary satellite and its need

8.3 Block diagram a satellite communication link and brief description of each block

8.4 Transponders, VSAT and its features

Unit 9. Introduction to Microwave Communications: [3]

9. 1. Introduction to microwave, advantages of microwave over lower frequency bands, applications of microwaves

9. 2. Microwave relay system (link), basic block diagram

LIST OF PRACTICALS

1. To plot the sensitivity characteristics of a radio receiver and determination of the frequency for maximum sensitivity
2. To plot the selectivity characteristics of a radio receiver
3. To plot the radiation pattern of a directional and omni directional antenna
4. To plot radiation pattern of a horn antenna.
5. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna
6. Familiarization and identification of fiber optic components such as fiber optic light source, detector etc.
7. To assemble the fiber optic communication set up (using teaching module) and compare the transmitted signal with the output of the receiver
8. Observe wave forms at input and output of ASK and FSK modulators
9. Transmission of data using MODEM.
10. To study the construction and working of a telephone handset.

NOTE:

Visits to appropriate sites of AM/FM Radio stations, telephone exchanges, microwave communication, satellite communication and fiber optic communication installations should be made with a view to understand their working. A comprehensive report must be prepared by all students on these visits, especially indicating the dates and locations of their visits.

RECOMMENDED BOOKS

1. Electronic Communication Systems, by G. Kennedy and B. Davis, Tata McGraw-Hill, New Delhi
2. Electronic Communications, by D.Roddy& J. Coolen
3. Communication system By A.K. Gautam S.K. Kataria Sons, Delhi
4. Communication Systems, by Sanjay Sharma, -S.K. Kataria and sons
5. An Introduction to analog and digital communications, by Simon Haykin. , John Wiley and Sons.
6. Radio Engineering by G.K. Mittal , Khanna Publishers, New Delhi
7. Electronics Communication by KS Jamwal, DhanpatRai& Sons, New Delhi
8. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
9. Handbook of Experiments in Electronics and Communication Engineering by S. Poornachandra Rao, and B Sasikala, Vikas Publishing House Pvt. Ltd, Jangpura, New Delhi
10. Latest Publications on the subject

Microwave and Radar Engineering

EG 3102EX

Total: 7 hours/week

Year: III **Lecture: 4 hours/week**

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Course description:

This subject deals with microwaves devices such as waveguides, microwave antennas and microwave communication systems. The subject also provides knowledge on Radar systems and VSAT.

Course Objectives:

On completion of this course, the students will be able to

4. Familiarize with microwave devices and components.
5. Understand microwave communiation systems.
6. Explain about the Radar systems and VSAT.

Course Contents:

Unit 1: Introduction to Microwaves [3]

1.1 Introduction to microwaves and its applications, Classification on the basis of its frequency bands (HF, VHF, UHF, L, S, C, X, KU, KA, mm, SUB, mm)

Unit 2: Microwave Devices [12]

2.1 Basic concepts of thermoinic emission and vacuum tubes,

2.2 Effects of interelectrode capacitance Lead Inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.

2.3 Construction, characteristics, operating principles and typical applications of the following devices (No mathematical treatment)

- Multi cavity klystron
- Reflex klystron
- Multi-cavity magnetron
- Traveling wave tube
- Gunn diode and
- Impatt diode

Unit 3: Waveguides [6]

3.1 Rectangular and circular waveguides and their applications.

3.2 Mode of waveguide

3.3 Propagation constant of a rectangular waveguide, Cut-off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation).

3.4 Impossibility of TEM mode in a waveguide.

Unit 4: Microwave Components [11]

4.1. Constructional features

4.2. Characteristics and application of tees, bends, matched termination, twists, detector, mount, slotted section, directional coupler, fixed and variable attenuator, isolator, circulator and duplex, coaxial to waveguide adapter

Unit 5: Microwave antennas [4]

5.1. Structure characteristics and typical applications of Horn and Dish antennas

Unit 6: Microwave Communication systems [8]

6.1. Block diagram and working principles of microwave communication link.

6.2. Troposcatter Communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation.

Unit 7: Radar Systems [12]

7. 1. Introduction to radar, its various applications, radar range equation (no derivation) and its applications.

7. 2. Block diagram and operating principles of basic pulse radar. Concepts of ambiguous range, radar area of cross-section and its dependence on frequency.

7. 3. Block diagram and operating principles of CW (Doppler) and FMCW radars, and their applications.

7. 4. Block diagram and operating principles of MTI radar.

7. 5. Radar display- PPI

Unit 8: Introduction to VSAT [4]

8.1. Transponders.

8.2. Multiple access techniques.

8.3. VSAT and its features**.**

LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron
2. To measure VSWR of a given load.
3. To measure the Klystron frequency by slotted section method
4. To measure the directivity and coupling of a directional coupler.
5. To plot radiation pattern of a horn antenna in horizontal and vertical planes.
6. To verify the properties of magic tee.
7. To carry out installation of a dish antenna.

RECOMMENDED BOOKS

1. Microwave Devices and Components by S.Y.Lio, Prentice Hall of India, New Delhi
2. Electronics Communication by Roddy and Coolen
3. Electronics Communication System by KS Jamwal, Dhanpat Rai & Sons, Delhi
4. Radar Engg by Skolynik

NOTE:

Visit to the appropriate sites of microwave industries, radar installations and communication stations should be made to understand their working. A comprehensive report must be prepared and presented by the students on their visits, especially indicating the dates and locations of their visits.

Troubleshooting and Maintenance of Electronic Equipment

EG 3103EX

Total: 7 hours/week

Year: III **Lecture: hours/week**
Semester: I **Tutorial: hours/week**
Practical: 7 hours/week

Course description:

This subjects deals with the hands on skills on troubleshoot and diagnosis of fault finding. It also imparts the skills on operation of electronic instruments such as multi-meter, logic pulsar, logic prob, soldering and desoldering station, CRO, digital IC tester etc. To provide hands on practice ands develop skill on construction, testing of operation and fault diagnosis in electronic circuits list of exercises are also recommended.

Course Objectives:

1 To enable the students to select and safe handling of electrical hand tools and test and measuring instruments.
2 To enable students to check function, operation, and performance of and electronic circuits.
3 To enable students to tracing electronics circuits and identification of fault and repair of basic electronics circuits.
4 To enable the students to understand the basic functional blocks, principles of operation of electronic equipment.
5 To enable students to check function, operation, and performance of an electronic circuits.
6 To enable students to assist and carry out the installation and commissioning of electronic equipment.
7 To enable students to care and maintenance of test and measuring instruments.

Course contents:

Unit 1. Introduction to maintenance principles [3]

1.1 Preventive and corrective maintenance.
1.2 Introduction to fault diagnosis techniques, using basic flow chart.

Unit 2. Assembling of DC low voltage power supply unit with Transistor Series Voltage regulator with over load and short circuit protection and testing of the parameters. [20]

2.1 Continuity and insulation resistance test.
2.2 Voltage measurements: Mains input voltage, DC, Unregulated voltage, regulated output voltage.
2.3 Load regulation characteristics
2.4 Line regulation characteristics.
2.5 Ripple voltage (Factor)
2.6 Current limit.

Unit 3. Basic analogue multimeter: Circuit tracing and identification of the components ans accessories with reference to circuit diagram. [15]

Unit 4. AM/FM Radio Receiver: [15]

4.1. Examine mechanical layout,
4.2. Dismantling and re-assembling procedure.
4.3. Operation check (performance check)
4.4. Tracing and identification of the components with reference to circuit diagram
4.5. Troubleshooting practice: Signal tracing and signal injection method,
4.6. DC voltage measurement,
4.7. Alignment and tuning of the IF and Oscillator circuits.

Unit 5. Monochrome (B & W) and color TV Receiver. [27]

5.1. Examine the mechanical layout
5.2. Recognition of external control devices and their function
5.3. Tracing and identification of components with reference to circuit diagram
5.4. Testing of DC voltage across the tube and semiconductors under normal condition without applying signal
5.5. Signal tracing using Oscilloscope across various functional blocks
5.6. Comparison of measured DC voltage and Oscillogram with reference to value indicated in the circuit diagram
5.7. Troubleshooting and repair practice with simulation of fault and test Identification of the fault and repair with logical approach

Unit 6. Optical disc player and optical data storage device. [10]

6.1 Safety precautions and demonstration of principle of operation.
6.2 Consideration when troubleshooting.
6.3 Discussion and demonstration of laser disk problems.

Unit 7. Installation and testing of EPABX unit. [15]

7.1 Examine the equipment and peripherals.
7.2 Installation practice referring installation manual.
7.3 Programming of user's fetchers and testing of operation of the system.

Computer Networks

EG 3101CT

Total: 6 hours/week

Year: III **Lecture: 3 hours/week**

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Course Description:

This course deals with fundamentals of computer networks, its architecture, its standards and protocols used in computer network.

Course Objectives:

After completing this course the students will be able to:

1. Understand the architecture of computer network
2. Know various hardware devices and software used in computer networks
3. Setup small home/office network

Course Contents:

Unit 1. Introduction to computer network: **[2]**

- 1.1. Introduction, definition, features, issues
- 1.2. Applications of computer networks

Unit 2. Network architecture: **[6]**

- 2.1. Network topologies
- 2.2. Network types: LAN, MAN, WAN
- 2.3. Layered network architecture, protocols, interfaces, services
- 2.4. OSI Reference model
- 2.5. TCP/IP Reference model
- 2.6. Standardization organizations

Unit 3. Network hardware and software: **[3]**

- 3.1. Network workstation and server: hardware and software requirements
- 3.2. Client server and peer-to-peer model
- 3.3. Network devices: Repeater, Hub, NIC, Bridge, Switch, Router, Gateway

Unit 4. Physical layer: **[5]**

- 4.1. Digital signals, line coding formats
- 4.2. Transmission impairment: attenuation, distortion, noise, interference
- 4.3. Channel bandwidth and throughput; propagation time, transmission time
- 4.4. Transmission media
  - Guided: coaxial, twisted-pair, fiber-optic
  - Unguided: radio, microwaves, infrared

Unit 5. Data link layer: **[5]**

- 5.1. Introduction to data link layer and its issues
- 5.2. Flow control at data link layer
- 5.3. Error control issues at data link layer
- 5.4. Data link layer protocols: HDLC, PPP

Unit 6. LAN architecture/standards: **[5]**

- 6.1. Introduction to LAN standards and architecture

6.2. Media access control, MAC address
6.3. CSMA/CD, Token ring, Token bus and IEEE 802.3, 802.4, 802.5
6.4. Introduction to wireless LAN, Bluetooth, Wi-Fi, Wi-Max

Unit 7. Network Layer: [8]

7.1. Internetworking
7.2. Switching: Circuit switching and packet switching
7.3. Addressing issues at network layer
7.4. IP address; Different classes; Private and Public address
7.5. Subnet mask and Subnetting; Classless addressing; Network address translation (NAT)
7.6. Routing and its necessity; static and dynamic routing; interior and exterior routing
7.7. Introduction to dynamic routing protocols: RIP. IGRP, OSPF
7.8. Network layer protocols: ARP, RARP, IP, ICMP
7.9. Introduction to IPv6 and its necessity

Unit 8. Transport layer: [4]

8.1. Transport layer issues: Congestion control, Flow control, Quality of service
8.2. Transport layer addressing, sockets
8.3. Segmentation and reassembly
8.4. Connection oriented and connectionless service
8.5. Transport layer protocols: TCP, UDP

Unit 9. Application Layer: [4]

9.1. Application layer and its function
9.2. Electronic mail: SMTP
9.3. File transfer: FTP
9.4. Dynamic host configuration protocol (DHCP)
9.5. DNS, HTTP, WWW

Unit 10. Network security: [3]

10.1. Cryptography, Digital signature
10.2. Firewalls
10.3. Virtual private network

Practical: [45]

In practical, students should be able to set up small networks. Also, they should be able to configure network hardware and network software. Following lab exercises may be helpful.

1. Installation 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. Installation and configuration of workstation PC
4. Setup peer-to-peer networking and verify it
5. Install and configure 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)
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

References books:

1. omputer Networks, A. S. Tanenbaum
2. Data Communications and Networking, Behrouz A. Forouzan

Consumer Electronics

EG 3108EX

Total: 7 hours/week

Year: III **Lecture: 4 hours/week**

Semester: I **Tutorial: hours/week**

Practical: 3 hours/week

Course Description:

The course provides detail knowledge of various electronic appliances so that the student built their confidence in the field of electronic by knowing working principle, block diagram & main features with assembling & fault diagnosis capacity of those equipments.

Course Objectives:

At the end of the course students will be able to:

1. Know various electronic audio and video devices and systems and their working principles,
2. Read block diagram,
3. Describe main features of consumer electronics gadgets/goods/devices like audio-systems, CD systems.
4. TV, VCR and other items like microwave ovens, photostat machines etc. which in-turn will develop in them capabilities of assembling, fault diagnosis and rectification in a systematic way.

Course Contents:

Unit 1. Audio System: **[10]**

1.1 Microphones: construction, working principles and applications of microphones, their types viz:

a) Carbon b) moving coil, c) velocity,
d) crystal, e) condenser, e) cordless etc.

1.2 Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures.

1.3 Principle of Sound recording on magnetic tape.

1.4 Digital sound recording on tape and disc.

1.5 CD System.

- Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifier.

Unit 2. Television:

2.1 Monochrome TV: **[16]**

- Elements of TV communication system.
- Scanning- its need for picture transmission.
- Need for synchronizing and blanking pulses.
- Progressive scanning- Gross structure, interlaced scanning, resolution and band width requirement, tonal gradation.
- Composite Video Signal (CVS) at the end of even and odd fields.
- Equalizing pulses and their need.
- Monochrome picture tube

- Construction and working, comparison of magnetic and electric deflection of beam.
- Construction and working of camera tube: vidicon and plumbicon, Block diagram of TV, camera and the transmitter chain.
- Block diagram of a TV receiver: function of each block and waveform at the input and output of each block.

Unit 3. COLOUR TV [16]

3.1 Primary colours, tristimulus values, trichromatic coefficients, concepts of additive and subtracting mixing of colours, concepts of luminance, Hue and Saturation, Representation of a colour in colour triangle, non spectral colour, visibility curve

3.2 Compatibility of colour TV system with monochrome system. Block diagram of colour TV camera.

3.3 Colour Schemes

- Introduction to PAL, NTSC, SECAM systems, Advantages and disadvantages, block diagram of video camera and its explanation
- Construction and working principles of trintron and PIL types of colour picture tubes.
- Concept of convergence, purity of beam shifting
- Block diagram of PAL TV receiver, explanation and working

Unit 4. Cable Television:- [6]

4.1. Block diagram and principles of working of cable TV and DTH, Cable TV using internet

Unit 5. VCD and DVD Players [6]

5.1 Working Principle of VCD and DVD recording and playback

Unit 6. Basic Block diagram, Working Principle and Application of: [6]

6.1. Solar power system
6.2. Photocopy machine.
6.3. Automatic washing machine
6.4. Microwave oven
6.5. Digital camera

LIST OF PRACTICALS

1. To plot the frequency response of a microphone
2. To plot the frequency response of a loud speaker
3. Demonstration of microwave oven
4. To observe the wave forms and voltage B/W and colour T.V receiver.
5. Fault finding of colour T.V
6. Trouble shooting of C.D. Player
7. Demonstration of DVD Player.
8. Demonstration and study to VCD especially its transport mechanism.
9. Study of a TV cable network system
10. Demonstration of photocopy machine
11. Demonstration of automatic washing machine
12. Demonstration of solar system

RECOMMENDED BOOKS

1. Colour Television-principles & practice R.R Gulati by Wiley Eastern Limited, New Delhi
2. Complete Satellite & cable Television R.R Gulati New age InternationalPublisher, New Delhi
3. Colour Television Servicing by RC Vijay BPB Publication, New Delhi
4. Colour Television & Video Technology by A.K. Maini CSB Publishers
5. Colour TV by A.Dhake
6. Service Manuals, BPB Publication, New Delhi

Principles of Management and Costing

EG 3101MG

Total: 4 hour /week

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

Semester: I **Tutorial: hours/week**

Practical: hours/week

Lab: hours/week

Course description:

This course is designed to develop understanding about principles and functions of management. It also deals with basic concepts of accounting, benefit and cost analysis and project risk.

Course Objectives:

After completing this course, the students will be able to

1. Familiarize with organization and management.
2. Explain humar resource management, motivation and leadership.
3. Apply skills for cash flow transaction, depreciation and rate calculation.

Course Contents:

First Part: Management

Unit 1: Organization and Management **[6]**

1.1 Definition of Organization and Management
1.2 Need of Management
1.3 Principles of Management (Henri Foyal)
1.4 Functions of Management (Planning, Organizing, Controlling, Supervision, Directing, Leading, Motivation etc.)
1.5 Types of Ownership and hierarchy level (In Brief)

Unit 2: Human Resource Management **[8]**

2.1 Introduction
2.2 Job Analysis
2.3 Recruiting Sources
2.4 Manpower Selection Process
2.5 Selection Devices
2.6 Socializing the new employees
2.7 Labor Welfare Schemes
2.8 Accidents and Safety measures

Unit 3: Motivation and Leadership **[8]**

3.1 Definition
3.2 Need and Functions of Leader
3.3 Managers as a Leader
3.4 Motivation Theory: Maslow's Need theory, Herzberg's two factor theory and MCGregor theory x and theory Y
3.5 Method of improving motivation
3.6 Job satisfaction and job enrichment
3.7 Disciplinary problems faced by managers

Unit 4: Strategy and Environmental Scanning **[6]**

4.1 Strategy with strategic plan
4.2 Environmental Scanning (External plus Internal Analysis)
4.3 Project analysis and project appraisal
4.4 Environmental and Technology (Today Perspective, with case study)
4.5 Technology and Society

Unit 5:Marketing **[8]**

5.1 Definition of market and marketing
5.2 Marketing Mix
5.3 Definition of FMCG and One Time Purchase goods
5.4 Understanding consumer Behavior and consumer satisfaction
5.5 Concept of channel of distribution (For heavy equipment, one time purchase items)
5.6 Sales Promotion
5.7 Direct Advertising (Target Group)
5.8 Role of technical manpower in marketing process.

Second Part: Estimating and Costing

Unit 6: Introduction and basic account concept. (In Brief) **[12]**

6.1 Role of engineering /technical manpower of the organization
6.2 Types of engineering economics decision
6.3 Finance and Capital Management

- Sources of finance for investment
- Concept of assets and liabilities
- Concept of fixed capital and selection of machine tools
- Concept of working capital and calculation
- Accounting - Basic Concept (definition, objectives and importance of accounting, concept of debit and credit, concept of journal and ledger, profit and loss account, balance sheet)
- Simple and compound interest rates, effective interest and continuous compound interest
- Depreciation methods, straight line, declining balance method.
- Cash flow, Net Present Value and Payback Period.
- Related numerical problems on interest and depreciation and NPV.

Unit 7: Benefit and Cost Analysis **[6]**

7.1 Calculation of benefits and costs
7.2 Definition on Benefits/Cost (B/V) ratio
7.3 Relation between B/C ratio and NPV
7.4 Related numerical problems on 8.1

Unit 8: Project Risk **[6]**

8.1 Definition of project risk
8.2 Sensitivity analysis
8.3 Breakeven analysis
8.4 Scenario analysis
8.5 Related numerical problems on 8.2, 8.3 and 8.4

Suggestions for Instruction:

1. Lectures
2. Guest speakers from industries
3. Student's presentations
4. Case studies from industries
5. Industrial visits
6. Use calculate or/and interest factor table during calculation demonstration.
7. Give examples of locally operating engineering activities and projects as much as possible

References;

1. Principles of Management, Philip Kotler, TEE Publication
2. Industrial Engineering and Management, TR Banga
3. Industrial Management, VK Sharma, OP Harkut
4. Agrawal, G.R (2003) Principles of Management in Nepal. M.K. Publishers and distributors, Kathmandu, Nepal
5. Mahajan, M. (2002), Industrial Engineering and production management (2nd ed.), Dhanpat Rai and Co. (P) Ltd., Delhi
6. Chan S. Park, 2002, Comtemporaru Engineering Economics, Third Edition, Prentice-Hall IndiaPvt. Ltd., New Delhi, India, ISBN-81-203-2143-X.
7. R Panneerselvam, 2001, "Engineering Economics", First Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, ISBN-81-203-1743-2
8. Decenzo, David A. and Robbins, Stephen P. (1997). Personal/ Human Resource Management (3rd ed.), Prentice Hall of India, New Delhi.
9. Dessler, Gary (2002). A Framework of Human Resource Management (2nd ed.) Pearson Education Asia, India.

Sixth Semester

Subjects

EG 3202 EX	**Advanced Communication System**
EG 3203 EX	**Elective I (any one of the followings)**
	(a) Microcontroller and Applications
	(b) Optical Fibre Communication
	(c) Imaging Technology and Equipment
	(d) Control System
	(e) Renewable Energy Technology
EG 3204 EX	**Elective II (any one of the followings)**
	(a) VLSI Design
	(b) Computer Organization and Architecture
	(c) Biomedical Instrumentation
	(d) Wireless and Mobile Communication
EG 3205 EX	**Major Project**
EG 3206 EX	**Medical Electronics**
EG 3201 MG	**Entrepreneurship Development**

Advanced Communication Systems

EG 3202 EX

Total: 7 hours/week

Year: III **Lecture: 4 hours/week**

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course Description:

This course deals with review of communication system, base band digital communication, principles and techniques for digital carrier modulation, coding theory, public telephone network, mobile communication system, future trends, acts regulations and policies in telecommunication.

Course Objectives:

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

1. Understand the fundamentals of digital data communication systems
2. Understand the fundamentals of cellular mobile communications systems
3. Understand the fundamentals of next generation networks and system
4. Know the recent trends and rules and regulations in telecommunications

Course Contnets:

Unit 1. Review: [6]

- 1.1 Analogue and digital carrier modulation/demodulation principles
- 1.2 Analogue and digital communication systems
- 1.3 Signals, spectra, fourier transform and systems

Unit 2. Baseband Digital Communication : [14]

- 2.1 Pulse Modulation Techniques
- 2.2 Pulse Amplitude Modulation (Natural sampling, flat-Top PAM)
- 2.3 Pulse Code Modulation (Sampling, Quantization, Encoding, Practical circuits, Bandwidth considerations, Signalling rate, Companding laws)
- 2.4 Digital Signalling (Binary, multi-level signalling, line codes, spectral efficiency, eye pattern)
- 2.5 Inter Symbol Interference (definition, mitigation measures)
- 2.6 Differential PCM and Delta Modulation.
- 2.7 Principles of Time Division Multiplexing (T1/E1 TDM PCM Hierarchy)

Unit 3. Digital Carrier Modulation principles and techniques: [6]

- 3.1 Amplitude, Frequency and Phase shift keying (ASK,FSK,PSK), Quadrature
- 3.2 Amplitude Modulation (QAM), Differential PSK]
- 3.3 Bandwidth and power efficiency of various digital carrier modulation techniques
- 3.4 Carrier and clock recovery techniques
- 3.5 Error probability and bit error rate

Unit 4. Introduction to Coding Theory: [10]

- 4.1. Introduction to Information theory and shannon hartley's channel capacity theorem
- 4.2. Effect of channel noise and interference on the performance of digital communication system

4.3. Source and channel coding theories (Shannon Fano and Huffmann coding, Hamming distance and Hamming weight and Introduction to Block and Convolution Codes)
4.4. Error detection and correction algorithms

Unit 5. Public Telephone Network: [6]

5.1 Public telephone network- instruments, local loops, trunk circuits, signalling, domestic and international trunk dialing
5.2 Digital Subscriber Lines; ISDN

Unit 6. Mobile Communication Systems: [14]

6.1 Evolution of cellular mobile communication systems, generation of mobile networks
6.2 Cellular mobile telephony
6.3 Frequency re-use
6.4 Interference
6.5 Cell spliting, sectoring and segmentation
6.6 cellular system topology
6.7 Roaming and handovers
6.8 Network components and call processing
6.9 Cellular Mobile standards: GSM, CDMA
6.10 Advanced technologies: WiFi, WiMax, UMB, LTE, IMT 2000

Unit 7. Next Generation Networks and Future Trends: [2]

7. 1. Definition and Terminologies
7. 2. Underlying technology components and applications
7. 3. Intelligent networks, converged networks

Unit 8. Acts, regulations and policies in telecommunication: [2]

8.1 Telecommunications Act 2053
8.2 Telecommunications Regulation 2053
8.3 Telecommunications policy 2060

LIST OF PRACTICALS

1. Laboratory based practicals are not foreseen in this course. The instructor is advised to manage site visits to the service operator's locations for familiarization of the technologies used.

RECOMMENDED BOOKS

1. An Introduction to analog and digital communications, by Simon Haykin., John Wiley and Sons.
2. Digital and Analogue communication systems, by Leon Couch II, Pearson Education, 2001
3. Advanced Electronic Communication Systems, Wayne Tomasi, Prentice Hall India, 2004
4. Communication Systems, by Sanjay Sharma, S.K. Kataria and sons
5. Relevant acts, regulations, policies of Government of Nepal
6. Latest Publications on the subject

Microcontroller and Applications

EG 3203EX
(Elective I)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course Description:
This course deals with micro-controllers and their application.

Course Objective:
After completing this course the students will be able to
1. Understand the architecture of 8051/8031 microcontroller.
2. Apply assembly and programming for microcontroller.
3. Understand the process of design and interface.

Course Contents:

Unit 1. Overview of Microcontroller series (MCS) [14]
- 1.1 Architecture of 8051/8031 Microcontroller
  - Pin details
  - I/O Port structure
  - Memory Organization
  - Special Function Registers (SFRs)
  - External Memory

Unit 2. Instruction Set; Addressing Modes, Instruction types [14]
- 2.1 Timer operation
- 2.2 Serial Port operation
- 2.3 Interrupts

Unit 3. Assembly/C programming for Micro controller [12]
- 3.1 Assembler directives
- 3.2 Assembler operation
- 3.3 Compiler operations
- 3.4 De bugger
- 3.5 Simulator

Unit 4. Design and Interface [12]
- 4.1. Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface.

Unit 5. Introduction of PIC Micro controllers [4]

Unit 6. Application of Micro controllers in Communication System [4]

LIST OF PRACTICALS
1. Familiarization with Micro-controller Kit
2. Assembly Language Programming (PC Based)
3. C Language Programming- (PC Based)

4. Write Program for LCD interface.
5. Write Program for A/D converter, result on LCD.
6. Write Program for D/A converter, result on LCD.
7. Write a Program for serial data transmission from Kit to PC.
8. Application of micro controllers in GSM.
9. Program to Interface Sensors.

RECOMMENDED BOOKS

1. Microcontrollers by Ayala
2. Microcontrollers by Mazidi
3. Microcontrollers by Neil Makanzie
4. Microcontrollers by Deshmukh
5. Embedded GSM Applications

Optical Fiber Communication

EG 3203EX
(Elective I)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:

This course deals with the principles of optical fiber communication system.

Course Objectives:

After completing this course the students will be able to
1 Explain basic optical communication systems.
2 Understand principles of optical fiber communication system

Course contents:

Unit 1. Introduction [8]

1.1 Historical perspective, basic communication systems, optical frequency range.
1.2. Application of fibre optic communication
1.3. Electromagnetic spectrum used,
1.4. Advantages and disadvantages of optical communication.
1.5. Principle of light penetration, reflection, critical angle.

Unit 2. Optical Fibers and Cables [10]

2.1. Fiber types construction,
2.2. Multimedia and monomode fibers,
2.3. Step index and graded index fibers,
2.4. Acceptance angle and acceptance types of optical fiber cables.

Unit 3. Losses in optical fiber cable: [10]

3.1 Absorption Losses, Scattering Losses, Radiation losses, Compelling losses, bending loses.
3.2 Dispersion, Material dispersion, wave guide dispersion, modal dispersion total dispersion and bit rate.

Unit 4. Light sources and Detectors [16]

4.1. Characteristics of light source used in optical communication,
4.2. Principle of operation of LED,
4.3. Different type of LED structures used and their brief description,
4.4. LED driving circuitry, Injection Laser diode, principle of operation,
4.5. Different injection laser diodes,
4.6. Comparison of LED and ILD, non-semiconductor laser.
4.7. Characteristics of photo detectors used in optical communication;
4.8. PIN diode and avalanche photo diode (APD), their brief description.

Unit 5. Connectors, Splicing and coupling [8]

5.1. Fiber alignment and joint losses
5.2. Splicing, types of splices, types of connectors used
5.3. Couplers, three and four port coupler, star coupler
5.4. Fiber optic switch.

Unit 6. Optical Fiber System [8]

6.1. Optical transmitter circuit
6.2. Optical receiver circuit
6.3. Optical power budgeting,
6.4. Multiplexing methods used
6.5. Modulation methods used

LIST OF PRACTICALS

1. Setting up of fiber analog link
2. Setting up to optic digital link
3. Measurement of various losses in optical fibers
4. To observe and measure the splice or connector loss
5. To measure and calculate numerical aperture of optical fiber
6. To observe characteristics of optical source
7. To observe characteristics of optical defector
8. To observe the radiation patter of LED
9. To Connectorise a fiber with connector at both ends
10. Introduction to various components and tools used in optical fiber communication

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
2. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi
3. Optical fiber Communication by ‘ Gerd Keiser, McGraw Hill International Editions
4. Optical Communications- Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi
5. Optical fiber Communication Systems by GP Agrawal, John Wiley & Sons, New Delhi
6. Optical fiber Communication and its Applications by S C Gupta, Prentice Hall of India, New Delhi

Imaging Technogy and Equipments

EG 3203EX
(Elective I)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:
This course deals with basics of medical imaging systems, blood pressure & sound, measurement of how & volume of blood and respiratory systems, chemical biosensors, clinical laboratory instrumentation, therapeutic and prosthetic devices.

Course Objectives:
After completing this course, the students will be able to:
1. To understand the image capturing and bio-medical equipments.

Course contents:

Unit 1. Medical Imaging System: [12]
- 1.1. Photography
- 1.2. Television system
- 1.3. Radiography, Computed radiography
- 1.4. Computed tomography
- 1.5. Magnetic resonance imagining
- 1.6. Nuclear medicine
- 1.7. Single-photon emission computed tomography
- 1.8. Positron emission tomography
- 1.9. Ultrasonography

Unit 2. Blood Pressure and Sound: [12]
- 2.1 Direct measurement
- 2.2 Harmonic analysis of blood-pressure waveforms
- 2.3 Dynamic properties of pressure-measurement system
- 2.4 Measurement of system response, Effects of system parameters on response
- 2.5 Systems for measuring venous pressure,
- 2.6 Heart sounds
- 2.7 Phonocardiography
- 2.8 Cardiac catheterization
- 2.9 Effects of potential and kinetic energy on pressure measurements
- 2.10 Indirect measurements of blood pressure
- 2.11 Tonometry

Unit 3. Measurement of Flow and Volume of Blood: [10]
- 3.1 Indicator-dilution method that uses continuous infusion
- 3.2 Indicator-dilution method that uses rapid injection
- 3.3 Electromagnetic flowmeters
- 3.4 Thermal-convection velocity sensors

3.5 Chamber plethysmography
3.6 Electric-impedance plethysmography
3.7 Photoplethysmography

Unit 4. Measurement of Respiratory System: [10]

4.1 Modeling the respiratory system
4.2 Measurement of pressure
4.3 Measurement of gas-flow rate, Lung volume
4.4 Respiratory plethysmography
4.5 Some tests of respiratory mechanics
4.6 Measurement of gas concentration
4.7 Some tests of gas transport

Unit 5. Chemical Biosensors: [10]

5.1 Blood-gas and acid-base physiology
5.2 Electrochemical sensors
5.3 Chemical fibrosensors
5.4 Ion-selective field-effect transistor (ISFET)
5.5 Immunologically sensitive field-effect transistor (IMFET)
5.6 Noninvasive blood-gas monitoring
5.7 Blood-glucose sensors

Unit 6. Clinical Laboratory Instrumentation: [6]

6.1 Spectrophotometry
6.2 Automated chemical analyzers
6.3 Chromatology
6.4 Electrophoresis
6.5 Hematology

LIST OF PRACTICALS

The laboratory exercises consist of visiting of medical equipment centers and preparing the report.

RECOMMENDED BOOKS

1. John G. Webster, "*Medical Instrumentation, Application and Design,*", John Wiley & Sons (Asia) Pte Ltd, 2003.
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "*Biomedical Instrumentation and Measurements*", Prentice-Hall of India Private Limited, 2001.
3. Joseph J. Carr, John M. Brown, "*Introduction to Biomedical Equipment Technology*", Pearson Education, 2003.
4. R S Khandpur, "*Handbook of BiomedicalInstrumentation*", Tata McGraw-Hill Publishing Company Limited, New Delhi, 1994.

Control System

EG 3203EX
(Elective I)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:
The inputs imparted through this subject will enable the students apprehend the various types of measurement techniques used in industrial process. The course includes the measurement of parameters most commonly used in industry like motion, flow, force, torque, temperature, pressure etc. used in control system.

Course Objectives:
On completion of this course, the students will be able to
1. Familiarize various types of measurement techniques in industry for motion, length, temperature, pressure, density etc.
2. Know different types of control devices and control mechanisms used in instrumentation and will provide understanding of simple control systems in a process plant

Course Contents:

Unit 1. Review of Measurement [8]
- 1.1. Measurement, method of measurement, types of instruments
- 1.2. Specifications of instruments: Accuracy, precision, sensitivity, resolution, range, errors in measurement, sources of errors, limiting errors, loading effect, importance and applications of standards and calibration

Unit 2. Control system [16]
- 2.1 Basic elements of control systems and control system terminology
- 2.2 Functional block diagram of a control system
- 2.3 Open loop and closed loop control systems
- 2.4 Manually controlled closed loop systems and automatic controlled closed loop systems. Examples of automatic control systems
- 2.5 Self regulating and non self-regulating processes

Unit 3. Basic Control Loops and Characteristics [12]
- 3.1 Basics of process control, process variables
- 3.2 Single and multi capacity processes
- 3.3 ingle capacity level, pressure, temperature and flow loop systems

Unit 4. Time Response Analysis [12]
- 4.1. Dynamic characteristics of systems
- 4.2. Linear and non-linear systems
- 4.3. Step response of first order and second order systems- overshoot and undershoot, damping ratio
- 4.4. Steady state response and error

Unit 5. Stability Analysis [12]
- 5.1. Concept of stability
- 5.2. Characteristic equation
- 5.3. Routh's stability criteria

5.4. Relative stability indices-phase margin and gain margin

Practical

1. Measurement of speed using Tachometer
2. Measurement of stress strain using strain gauge
3. Measurement of flow using rotometer
4. Measurement of temperature using thermocouple
5. Measurement of various pressure elements
6. To study circuit and working of open loop system
7. To study circuit and working of closed loop system
8. To study transfer function of a given system
9. To find time lag, overshoot and other parameters of a system
10. To study step response of a first order system
11. To study step response of a second order system

References:

1. Mechanical Measurement and Instrumentation by A K Sawhney
2. Measurement Systems Application and Design by Ernest O Doebelin
3. Instrumentation, Measurement and Analysis by BC Nakra and KK Chaudhry
4. Control System Engineering by Nagrath and Gopal
5. Control Systems by K Ogata

Renewable Energy Technology

EG3203EX

(Elective I)

Total: 7 hour /week

Year: III **Lecture: 4 hours/week**

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Lab: hours/week

Course Description:

This course deals with fundamentals of different renewable energy resources and their role in sustainable development.

Course Objectives:

After completing this course the students will be able to:

1. Identify the different renewable energy resources and their importance.
2. Understand the basic principles behind renewable energy sources like hydro, solar, wind and biomas.
3. Compare the prospects of renewable energy resources

Course contents:

Unit 1 Introduction [8]

1.1 World energy scenario

1.2 Energy crisis

1.3 Renewable energy resources

- Solar energy
- Hydro electricity
- Biomass
- Wind energy
- Geothermal energy
- Tidal energy
- Wave energy

Unit 2 Solar Energy [16]

2.1 Solar radiation

- Electromagnetic spectrum
- Prediction of solar radiation

2.2 Solar thermal energy

- Domestic hot water system
- Solar dryer
- Solar distillation
- Solar ponds
- Swimming pool heating
- Concentrating collectors
- Flat plate collectors

2.3 Solar-electricity

- Fundamental principle of photovoltaic conversion

- Types of photovoltaic cells (mono-crystalline, poly-crystalline, thin film or amorphous cells)
- Solar module, energy storage battery, charge controller
- Solar home system and solar water pumping

Unit 3 Hydro-electricity [13]

3.1 Water head, flow and power from water

3.2 Types of hydropower plants
- Large hydro, medium hydro, small hydro, micro hydro, peltric set

3.3 Micro-hydro power
- Feasibility study and evaluation of potential of hydro power
- Demand survey and calculation of micro-hydro size
- Hydraulic structures
- Electromechanical equipments
  - turbine
  - generator
  - governer
  - automatic voltage regulator
  - electronic load controller
  - ancillary equipments

Unit 4 Biomass [13]

4.1 Biomass as a fuel
- Direct combustion
- Gasification
- Pyrolysis
- Anaerobic digestion – Biogas

4.2 Role of biogas in Nepal

4.3 Components of Biogas system
- Biogas constituents
- Biodigester
- Biogas inputs (feeds)
- Digestion
- Slurry
- Use of Biogas (cooking, lighting etc)

4.4 Presentation Package: Microsoft PowerPoint

Unit 5 Wind Energy [10]

5.1 Power from the winds

5.2 Wind turbines
- Horizontal axis turbines
- Vertical axis turbines

5.3 Electricity generation from wind turbines

5.4 Wind farm

Practical Exercises [45]

1. Measurement of solar radiation
2. Solar Home System: Solar cells and connection, charge controller and storage battery
3. Use of solar heaters, solar ovens, solar dryers
4. Study of Micro-hydro systems/peltric set with electronic load controller
5. Study of Biogas system
6. Study of wind turbine, induction generator and generation controller

Reference Books:

1. Renewable Energy, Power for a sustainable future by Godfrey Boyle, Oxford University Press.
2. John W. Twidell and Anthony D. Weir, Renewable Energy Resources, English Language Book Society, ISBN 0419144706, Edition 1986
3. Philip G. Hill, Power Generation, Resources, Hazarch Technology and Costs, MIT Press, 1977
4. A. Thumann, Fundamentals of Energy Engineering, Fairmount Press, Prentice Hall Inc., 1984
5. A.W. Culp, Principles of Energy Conversion
6. G.D.Rai, Non-Conventional Energy Sources, Khanna Publisher, New Delhi, India

VLSI System Design

EG 3204EX
(Elective II)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course Description:
This course presents an introduction to Very-large-scale integration (VLSI) system design

Course Objectives:
After completing, this course the student will able to do:
1. Explain the importance of VLSI system design.
2. Explain and apply the combinational circuit design.
3. Explain and use Sequential circuit design.
4. Familiarize with CPLDs and FPGAs.

Course Contents:

Unit 1. Overview of VLSI: **[14]**
- 1.1 Introduction to Computer-aided design tools for digital systems.
- 1.2 Hardware description languages,
- 1.3 Introduction to VHDL,
- 1.4 Data objects, Classes and data types,
- 1.5 Operators, Overloading, Logical operators.
- 1.6 Types of delays,
- 1.7 Entityand Architecture declaration.
- 1.8 Introduction to behavioural, dataflow and structural models.

Unit 2. VHDL Statements: **[12]**
- 2.1 Assignment statements,
- 2.2 sequential Statements and process,
- 2.3 Conditional statements,
- 2.4 Case statements,
- 2.5 Concept and use of Concurrent statements.

Unit 3. Combinational Circuit Design: **[13]**
- 3.1 VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.

Unit 4. Sequential Circuit Design: **[12]**
- 4.1. VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

Unit 5. Introduction to CPLDs and FPGAs: **[9**]
- 5.1. Programmable logic devices: ROM, PLAs, GAL, PEEL, CPLDs and FPGA.

LIST OF PRACTICALS

Simulation, Synthesis, and Implementation of

1. 8: 1 Multiplexer, 2:4 Decoder, Comparator and Adder.
2. Flip Flop(s), Shift Register and Counter.
3. Lift Controller/Traffic Light Controller / UART. Anyone of the three.
4. Parity generator and Checker.
5. Implementation of RAM *I* FIFO.
6. Ramp waveform generator using DAC
7. Bi-directional buffer
8. Temperature sensing using ADC, Displaying on 7-Segment display and threshold setting using keyboard

Recommended Software for practical work:

Xilinx Synthesis Software (web pack) freely available on internet. On Xilinx.com VLSI System Design is window software for designing (System Designing).VLSI Learning Resource like Ex-VLSI. The practicals should include basic design exercise base on above contents.

RECOMMENDED BOOKS

1. IEEE Standard VHDL Language reference Manual (1993)
2. Digital System Design using VHDL, Charles. H. Roth; PWS (1998)
3. VHDL-IV Edition: Perry; TMH (2002)

Computer Organization and Architecture

EG 3204EX
(Elective II)

Total: 7 hour /week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course Description:

This course is an introduction to computer architecture and organization. It covers topics in both the physical design of the computer (organization) and the logical design of the computer (architecture).

Course Objectives:

After completing this course the student will able to:

1. Explain the over view of computer organization
2. Explain the principle of CPU system
3. Explain the principle of memory system
4. Explain the principle of data flow

Course Contents:

Unit 1. Basic computer architecture: [9]

1.1 Introduction
- History of computer architecture
- Overview of computer organization
- Memory Hierarchy and cache
- External Memory
- Organization of hard disk

1.2 Instruction codes
- Stored program organization-Indirect address
- Computer Registers
- Common bus system
- Computer instruction
- Instruction set

1.3 Timing and Control-Instruction Cycle:
- Fetch and decode
- Limiting errors

1.4 Type of Instruction
- Register reference Instruction
- Memory reference instruction
- Input and output interrupt

Unit 2. Micro programmed control: [11]

2.1 Basic Computer Design of Accumulator
- Control of AC register
- Adder and logic circuit

- ALU organization

2.2 Control Memory-Address Sequencing
- Conditional Branching
- Mapping of Instruction-Subroutines

2.3 Micro program
- Symbolic Micro program
- Binary Micro program

2.4 Design of control unit
- Basic requirement of control unit
- Structure of control unit
- Hard wired control unit
- Micro program sequencer

Unit 3. Central processing Unit: [15]

3.1 General Register Organizations:
- Control word. Stack organization. Instruction
- Formats-Addressing Modes

3.2 Data transfer and Manipulation:
- Data Transfer Instructions
- Data Manipulation Instructions
- Arithmetic Instructions
- Logical and Bit Manipulation Instructions
- Shift Instructions.

3.3 Program control:
- Status bit conditions
- Conditional Branch Instructions
- Subroutine Call and Return
- Program Interrupt
- Types of Interrupts.

3.4 Reduced Instruction set
- Computer (RISC):
- CISC Characteristics
- RISC Characteristics
- Overlapped Register
- Windows-Berkeley RISC I.

Unit 4. Computer arithmetic and memory organization: [13]

4.1 Addition and Subtraction:
- Hardware Implementation-
- Hardware Algorithm
- Addition and Subtraction with Signed-2's Complement

4.2 Data Multiplication Algorithms:
- Booth Multiplication Algorithm
- Array Multiplier.

4.3 Division Algorithms:

- Divide overflow
- Hardware Algorithm
- Floating Point Arithmetic Operations
- Basic considerations-Register Configuration

4.4 Memory concept
- Main Memory
- Auxiliary Memory
- Associative Memory

4.5 Memory Hardware Organisation
- Match Logic
- Read operation and Write operation.
- Cache memory
- Associative Mapping
- Direct Mapping
- Set-Associative Mapping
- Writing into Cache-Cache Initialization.
- Virtual Memory-Address space and Memory space-

4.6 Address mapping Using Pages
- Associative Memory page table
- Page Replacement-Memory Management Hardware
- Segmented-Page Mapping

Unit 5. Pipeline, vector processing and multiprocessors: [12]

5.1 Parallel Processing
- Pipelining-Arithmetic
- Pipeline-Instruction

5.2 Pipeline Examples
- Four Segment Instruction Pipeline-
- Data Dependency
- Handling of Branch Instructions.
- RISC Pipeline
- Three Segment Instruction
- Delayed load-Delayed branch.

5.3 Vector Processing:
- Vector operations
- Matrix Multiplication
- Memory Interleaving
- Super computers. array processors:
- Attached Array Processor-SIMD Array processor.

Practical: **[45]**

8085 Assembly Language program:

1. Multi byte Addition and Subtraction
   Multi byte decimal addition and subtraction
2. Adder and substractor circuit
3. Study of 8259 programmable interrupt controller - Development of interrupt service routine
4. Keyboard/display controller- Keyboard scan- blinking and rolling display
5. Parallel data transfer
6. Study of Microcomputer development system

Text books:

1. Morris Mano.M., Computer System architecture, PHI, 1993.

Reference books:

1. Hamacher.V.C, Vranesic. Z.G and Zaky. S.G., Computer Organisation, McGraw Hill, New York, III Edition, 1990.
2. Hayes, Computer System Architecture, Mc Graw Hill, 1998.
3. M. Morris Mano, Computer System Architecture

Biomedical Instrumentation

EG 3204EX
(Elective II)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:
This course deals with study, design, uses and applications of advanced biomedical equipments. It also imparts basic concepts of medical instruments, design analysis of various types of medical instruments currently using in medical, clinical and hospital field.

Course Objectives:
After completing this course the student will be able to:
1. Describe the uses of various kinds of biopotential electrodes.
2. Explain the uses and applications of different physiological transducers
3. Check, maintenance, diagnosis and testing of various medical instruments

Course contents:

Unit 1. Biomedical Engineering [5]
- 1.1 Introduction
- 1.2 Biometrics
- 1.3 Man-instrument system
- 1.4 Components of man-instrument system
  - Subject
  - Stimulus
  - Transducers
  - Signal conditioning equipments
  - Display
  - Recording and data transmission
  - Data storage
- 1.5 Physiological system of the human body

Unit 2. Biomedical system [8]
- 2.1 Bioelectric potential
- 2.2 Resting potential
- 2.3 Action potential
- 2.4 Propagation of action potential
- 2.5 Biological signals
- 2.6 Electrodes
- 2.7 Biopotential electrodes
- 2.8 Microelectrodes
- 2.9 Sin surface electrodes

Unit 3. Measuring and monitoring system [12]
- 3.1 Electrocardiograph (ECG)
  - The electrocardiogram

- The electrocardiographic diagnosis
- ECG lead configurations
- Computer aided electrocardiograph analysis

3.2 Electroencephalograph (EEG)

- EEG electrode configurations
- EEG recording techniques
- Practical; details of EEG

3.3 Electromyograph (EMG)

- Electromyographic recording techniques
- Different muscle related diseases

Unit 4. Diagnostics and Imaging Instruments [9]

4.1 Principle of ultrasonic measurement
4.2 Ultrasonic imaging system
4.3 X-Ray and radio instruments

- Basic definition of radiology
- X-ray tubes
- Block diagram of x-ray machine
- Biological effects of x-rays

4.4 CAT scan machine
4.5 Nuclear magnetic resonance imaging system

Unit 5. Patient monitoring system and biotelemetry [8]

5.1 ECG Monitoring
5.2 B.P monitoring
5.2 ICU monitoring instruments
5.4 Biotelemetry for general use
5.5 The components of a biotelemetry system
5.6 Design of a system.
5.7 Multichannel system
5.8 Frequency modulation techniques in telemetry link
5.9 Real time processing
5.10 Telemetry in operating room
5.11 Sports physiology studies through telemetry

Unit 6. Therapeutic and prosthetic devices [8]

6.1 Cardiac pacemakers and other electric stimulators
6.2 Defibrillators
6.3 Hemodialysis
6.4 Lithotripsy
6.5 Ventilators
6.6 Therapeutic applications of the laser

Unit 7. Electrical safety of Medical; equipment [10]

7.1 Introduction
7.2 Physiological effects of electricity
7.3 Leakage currents
7.4 Physiological effects due to magnetic fields
7.5 Safety code for the electro-medical equipments
7.6 Basic approaches to protection against shock

7.7 Protection of the hospital equipments

- Grounding system
- Distribution of electric power
- Isolated power system
- Ground fault circuit interrupter
- Protection: Equipment design
- Test of electrical appliances

LIST OF PRACTICALS

1. Study on anatomy and physiology system of the body
2. Design study of different types of electrodes used in medical electronics
3. Case study of physiological transducers and design
4. Study of intracranial pressure transducer
5. Computer aided ECG analysis and their recording techniques
6. Practical details of EEG machine
7. Practical details of EMG machine
8. Diagnostic X-ray machine and uses
9. Diagnostic ultrasound machine and their applications
10. Study and orientation of CT and MRI machines
11. Design study of telemetry system in ICU department of the hospital
12. Study of different Therapeutic devices
13. Design study of electrically safety medical equipments

RECOMMENDED BOOKS

1. John G. Webster, Medical Instrumentation, Application and Design: Third edition, John Wiley and sons, New York
2. Leslie Cromwell, Bio medical Instrument and measurements, Prentice Hall, Inc, Englewood cliffs

Wireless and Mobile Communication

EG 3204EX
(Elective II)

Total: 7 hours/week
Year: III **Lecture: 4 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:

This course deals with wireless and mobile communication technology that is complex but is spreading at a very fast rate. This course teaches the students about the principle and functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

Course Objectives:
After completing this course the students will be able to
1 Understand basic principles of wireless communications.
2 Explain basic concept of cellular communication system.
3 Explain basic principles, characteristics and applications of mobile communication system.
4 Understand basic principles, characteristics and applications of CDMA and GSM system.

Course contents:

Unit 1. Wireless Communication [12]

1.1 Basics
1.2 Advantages of wireless communication
1.3 Electromagnetic waves.
1.4 Frequency Spectrum used.
1.5 Paging system.
1.6 Cordless Telephone System.
1.7 Cellular Telephone System
1.8 Comparison of above wireless communication systems.
1.9 Propagation considerations
- Range
- Atmospheric Effect
- Geographic Effect
- Fading
- Doppler Effect

Unit 2. Cellular Concept [12]

2.1 Cell area
2.2 Capacity of cell
2.3 Frequency Response
2.4 Co-channel Interference
2.5 Adjacent channel Interference

2.6 Power Control for reducing Interference

2.7 Improving coverage and capacity in cellular system

- Cell Splitting.
- Sectoring
- Repeater for Range Extension.

Unit 3. Multiple Access Techniques for Wireless Communication [16]

3.1 Introduction to Multiple Access.

3.2 Frequency Division Multiple Access (FDMA)

3.3 Time Division Multiple Access (TDMA)

3.4 Code Division Multiple Access (CDMA)

3.5 Spread Spectrum Multiple Access (SSMA)

3.6 Frequency Hopping spread Spectrum (FHSS).

3.7 Comparison of FDMA/TDMA/CDMA

Unit 4. Mobile Communication Systems [20]

4.1 Advanced Mobile Phone System (AMPS)

4.2 Operation of AMPS

4.3 Working of AMPS Phone System

4.4 Introduction of Global Systems for Mobile Communication (GSM) and its architecture, Introduction of CDMA System, comparison of CDMA and GSM Systems

4.5 Introduction of GPRS and GPS System.

4.6 Introduction to DTH, Blue tooth, Wi-Fi and RDFI.

LIST OF PRACTICALS

Wireless and mobile communication is having significant impact in electronics market. For the Proper awareness of this subject it is must to provide the students the detail functioning of wireless/ mobile system/equipment. For this at least three visits must be arranged to BTS/MSC (MobileSwitching Centre) providers.

RECOMMENDED BOOKS

1. Wireless Communications (Principles and Practice), by Thedore S.Rappapoirt.
2. Introduction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.
3. Wireless Communications and Networking, by William Stallings.
4. Mobile and Personal Communication Systems and Services, by Raj Pandya, Prentice Hall of India, New Delhi
5. Mobile Communication by John Schiller, Prentice Hall of India, New Delhi
6. Wireless Communications by Pahalwan, Pearson Publishers

Major Project

EG 3205EX

Total: 7 hours/week

Year: III **Lecture: 4 hours/week**

Semester: II **Tutorial: hours/week**

Practical: 3 hours/week

Course Description:

The major project is basically focused for third year second part after completion of major courses. The students are supposed to do projects in the field of IT sectors. Besides them, they may do projects in the communications, instrumentations, control system, digital system based project, audio/video analysis system, home appliances/ security projects etc.

1. The project work involves the following:
    - Selection of relevant topic
    - Selection of design criteria
    - Necessary calculations
    - Selection of components
    - Assemble the device
    - Test the device/result findings
    - Report writing
    - Submission of report and assembled device
    - Viva voce (in the presence of an external examiner)

In order to help/direct the students to do their project work properly, each student will be supervised by a teaching staff of the department.

2. Projects that students are supposed to do must be in the list as per market demand, industrial requirements, students interest-based, previous project improvement based, new ideas implementation based and so on.

3. Evaluation procedure of the project work must be as per department rule and regulation based! The total marks assigned to the given project work evaluation that is to be carried out in the following way:

    - Report writing: 20%
    - Device/result: 60%
    - Presentation: 20%

Medical Electronics

EG 3206EX

Total: 6 hours/week
Year: III **Lecture: 3 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 3 hours/week

Course description:
This course deals with the fundamentals of anatomy and physiology and medical eelectronic equipment and their applications in biomedical field. Students will understand basic principles of transducer and physiological transducers and other medical instruments.

Course Objectives:
After completing this course the student will be able to:
1. Familiarize with anatomy and phisiology.
2. Explain the operating principles of various types of transducer for using in the biomedical field.
3. Describe the blood pressure and sound measurements
4. Enable to learn the basic principles of different instruments used in medical science.

Course Contents:

Unit 1. Anatomy and physiology [6]
- 1.1 Elementary ideas of cell structure
- 1.2 Heart and circulatory system.
- 1.3 Central nervous system
- 1.4 Muscle action
- 1.5 Respiratory system
- 1.6 Body temperature and reproduction system

Unit 2. Overview of Medical Electronics Equipment [4]
- 2.1 classification,
- 2.2 application and specifications of diagnostic, therapeutic and clinical laboratory equipment,

Unit 3. method of operation of these instruments

Electrodes [5]
- 3.1 Bioelectric signals,
- 3.2 Bio electrodes, Electrode, Electrode tissue interface,
- 3.3 contact impedance,
- 3.4 Types of Electrodes, Electrodes used for ECG , EEG

Unit 4. Transducers [5]
- 4.1. Typical signals from physiological parameters,
- 4.2. Pressure transducer,
- 4.3. Flow transducer, temperature transducer, pulse sensor, respiration sensor

Unit 5. Bio Medical Recorders [10]
- 5.1. Block diagram description and application of following instruments
  - ECG Machine
  - EEG Machine
  - EMG Machine

Unit 6. Patient Monitoring Systems [10]

6.1. Heart rate measurement

6.2. Pulse rate measurement

6.3. Respiration rate measurement

- Blood pressure measurement
- Principle of defibrillator and pace mark

Unit 7. Safety Aspects of Medical Instruments [5]

7. 1. Gross current shock

7. 2. Micro current shock

7. 3. Special design from safety consideration

7. 4. Safety standards.

LIST OF PRACTICALS

1. Study of human anatomy and physiology with respect to medical electronics.
2. Study of different types of electrode used in medical electronics
3. Study of different types of transducers used in medical electronics
4. To study and check specifications of an ECG Recorder.
5. To study and check specifications of an EEG Recorder
6. Study of Pacemaker, defibrillators
7. To implement Heart rate Meter.

RECOMMENDED BOOKS

1. Handbook of biomedical Instrumentation by RS Khandpur
2. Biomedical Instrumentation by Cromwell,
3. Modern Electronics Equipment by RS Khandpur, TMH, New Delhi
4. Introduction to Biomedical Electronics by Edward J. Perkstein; Howard B.J., USA

Entrepreneurship Development

EG 3201MG

Total: 5 hours/week
Year: III **Lecture: 3 hours/week**
Semester: II **Tutorial: hours/week**
Practical: 2 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. Understand the concept of business and entrepreneurship
2. Explore entrepreneurial competencies
3. Analyze business ideas and viability
4. Learn to formulate business plan with its integral components
5. Manage small business

Course contents:

Theory

Unit 1: Introduction to business & entrepreneurship [9]

- 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 [10]

- 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]

- 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 **[17]**

4.1 Needs and importance of business plan

4.2 Marketing plan

- Description of product or service
- Targeted market and customers
- Location of business establishment
- Estimation of market demand
- Competitors analysis
- Estimation of market share
- Measures for business promotion

4.3 Business operation plan

- Process of product or service creation
- Required fix assets
- Level of capacity utilization
- Depreciation & amortization
- Estimation office overhead and utilities

4.4 Organizational and human resource plan

- Legal status of business
- Management structure
- Required human resource and cost
- Roles and responsibility of staff

4.5 Financial plan

- Working capital estimation
- Pre-operating expenses
- Source of investment and financial costs
- Per unit cost of service or product
- Unit price and profit/loss estimation of first year

4.6 Business plan appraisal

- Return on investment
- Breakeven analysis
- Risk factors

Unit 5: Small business management **[5]**

5.1 Concept of small business management

5.2 Market and marketing mix

5.3 Basic account keeping

Practical **[30 Hours]**

Unit 1: Overview of business & entrepreneurship **[2]**

1.1 Collect business information through interaction with successful entrepreneur

Unit 2: Exploring and developing entrepreneurial competencies **[2]**

2.1 Generate innovative business ideas

Unit 3: Product or service identification and selection **[2]**

3.1 Analyze business ideas using SWOT method

Unit 4: Business plan formulation **[22]**

4.1 Prepare marketing plan

4.2 Prepare operation plan

4.3 Prepare organizational and human resource plan

4.4 Prepare financial plan

4.5 Appraise business plan

4.6 Prepare action plan for business startup

Unit 5: Small business management **[2]**

5.1 Prepare receipt and payment account

5.2 Perform costing and pricing of product and service

Text books:

क) प्रशिक्षकहरुका लागि निर्मित निर्देशिका तथा प्रशिक्षण सामग्री, प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद्, २०६९

ख) प्रशिक्षार्थीहरुकालागि निर्मित पाठ्यसामग्री तथा कार्यपुस्तिका, प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद् (अप्रकाशित), २०६९

Reference book:

Entrepreneur's Handbook, Technonet Asia, 1981.