

CURRICULUM
DIPLOMA
Civil Engineering

(Three year program-semester system)



Council for Technical Education and Vocational Training

Curriculum Development Division

Sanothimi, Bhaktapur

2013

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1. Introduction:

Civil 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 Civil Engineering. This field has been helping the world for the all-round physical infrastructure 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 middle level technical workforce equipped with knowledge and skills related to the field of Civil 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 Civil Engineering.

2. Curriculum title:

Diploma in Civil Engineering (DCE)

3. Programme objectives:

This curriculum has following objectives to:

1. Prepare technicians who are capable of undertaking works in civil engineering field as Civil Engineering Technicians under Road, Irrigation, Water supply, Urban Development and Building Construction and other civil infrastructures development related departments and sectors;
2. Produce middle level competent technical workforce/human resources that could provide supervisory works of civil engineering;
3. Prepare technical workforce who will demonstrate positive attitude and respect for the profession and socio-cultural values;
4. Help in meeting the demand of required Civil Engineering Technicians for the public and private infrastructure development sector of Nepal;
5. Reduce the dependence on employing such technicians from foreign countries and
6. Create self employment opportunities.

4. Programme description:

This course is based on the job required to perform by the Civil Engineering Technicians (Civil Overseer) at different levels of public and private sectors physical infrastructures development related civil engineering works in Nepal. Therefore, this curriculum is designed to provide knowledge and skills focusing on Civil Engineering related to the occupation. There are six semesters in total within the period of three years. The first year courses are offered focusing on foundational and core subjects of engineering; the second year courses are focused on basic disciplinary subjects of Civil Engineering. Similarly, the third year whole courses comprise of the disciplinary subjects including provision of

elective subjects. Moreover, the third year insists on the application of learned skills and knowledge through the Minor Project and Major Project.

The foundational subjects like Physics, Chemistry, and Mathematics are offered in diffusion model of curricular programme are applicable in the field of Civil Engineering. It also includes language subjects like Nepali and English applicable for the communication in the same area. The disciplinary subjects of Civil Engineering are offered in this programme are included in all semesters. This curricular programme also makes provision of project works as well as elective subjects in the specific areas of Civil Engineering. The curriculum structure and the subject wise content that reflect the details of this curriculum. In brief, this curriculum will guide to its implementers to produce competent and highly employable middle level technical workforces in the field of civil engineering.

The content of individual subjects prescribed in the curriculum are incorporated in the light of "must know and must do" principle of knowledge and skills for this level.

5. Duration:

The total duration of this curricular program is three years. Each year consists of two semesters of six months each. Moreover, one semester consist of 19.5 academic weeks including 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 will be maximum of 48 (Forty eight) in a batch.

8. Target location:

The target location will be all over Nepal.

9. Entry qualification:

Entry qualification of the applicant for diploma in civil engineering programme should be SLC pass or equivalent or Technical SLC (TSLC) in related subject. S/he should have English, Science, and Compulsory Mathematics in SLC or as per provisions mentioned on CTEVT admission guidelines.

10. Entry criteria:

- Should submit SLC or equivalent certificate
- Should pass entrance examination as administered by CTEVT

11. Selection:

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

12. Medium of instruction:

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

13. Pattern of attendance:

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

14. Teacher and student ratio:

- For theory: As per the nature of the course
- For practical / demonstration: 1:10
- For bench work: 1:8

15. Teachers and demonstrators:

- The disciplinary subjects' related teachers should be a bachelor's degree holder in the related area with three years experience in the related field.
- The demonstrators should be 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 holder in the related area.

16. Instructional media and materials:

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

- **Printed Media Materials** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, 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 teachings for this curricular program will be a combination of several approaches. Such as Illustrated 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. Mode of education:

There will be inductive and deductive mode of education

19. 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 wise final examination will be allocated for theoretical components of a subject.
- The final semester examinations of all theory components will be administered 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 needs.
- Student who fails in the internal assessment will not be allowed to sit in the semester final examination and will also be not allowed continuing the following semester.

20. Provision of back paper:

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

21. 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.

22. Pass marks:

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

23. 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: -

Marks division:

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

24. 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 Civil Engineering**.

25. Career path:

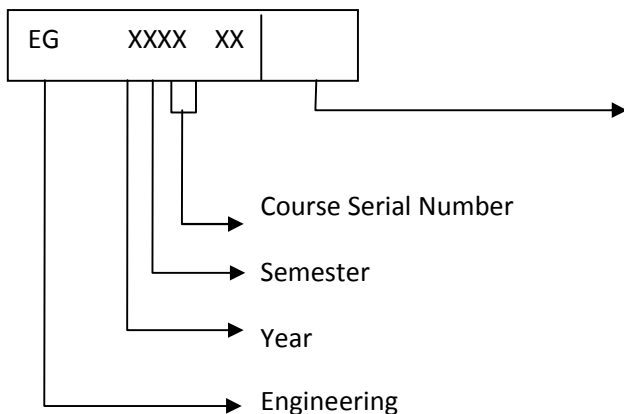
The graduates will be eligible for the position equivalent to Non-gazetted 1st class (technical) as Civil Sub-engineer (Civil Overseer) or as prescribed by the Public Service Commission of Nepal. The graduate will be eligible for registration with the related Council in the grade as provisioned in the related Council Act (if any).

26. Curriculum and credits:

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

27. Subjects codes

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



Offering Departments:

- AR: Architecture
- EE: Electrical Engineering
- ME: Mechanical Engineering
- EX: Electronics Engineering
- CT: Computer Engineering
- CE: Civil Engineering
- SH: Science and Humanities
- MG: Management

28. Provision of elective subjects:

There will be provision of elective subjects in final semester of this curricular programme. Some subjects of civil engineering discipline are offered here with provision of the elective; viz Trail Bridge, Hill Road, Hill Irrigation, Gravity Flow water Supply System and Rural/Agriculture Road.

29. Curriculum structure:

Curriculum Structure of Diploma in Civil Engineering

YEAR: I

SEMESTER I

S.N.	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
			L	T	P	Lab		Theory			Practical				
								Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	EG 1101 SH	Communication Nepali	2				2	10	40	1.5				50	*Continuous assessment
2	EG 1102 SH	Communication English	2				2	10	40	1.5				50	
3	EG 1103 SH	Engineering Mathematics I	4	1			5	20	80	3				100	
4	EG 1104 SH	Engineering Physics I	3	1		2	6	20	60	3	10	10	1.5	100	
5	EG 1105 SH	Engineering Chemistry I	3	1		2	6	20	60	3	10	10	1.5	100	
6	EG 1101 CE	Workshop Practice I	2		10		12				120	80	4	200	
7	EG 1101 AR	Engineering Drawing I	1		4		5				60	40	4	100	
TOTAL			17	3	14	4	38	80	280		200	140		700	

YEAR: I

SEMESTER II

S.N.	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
			L	T	P	Lab		Theory			Practical				
								Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
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	EG 1201 CE	Workshop Practice II	2		8		10				120	80	4	200	
5	EG 1202 CE	Engineering Materials	5			2/2	6	20	80	3	25			125	
6	EG 1201 AR	Engineering Drawing II			4		4				60	40	4	100	
7	EG 1211 CT	Computer Application	2		2		4	10	40	1.5	30	20	3	100	
TOTAL			18	3	14	5	40	90	320		255	160		825	

Curriculum Structure of Diploma in Civil Engineering

YEAR: II

SEMESTER I

S.N.	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
			L	T	P	Lab		Theory			Practical				
								Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	EG 2104 SH	Engineering Mathematics III	3	1			4	20	80	3				100	*Continuous assessment
2	EG 2101CE	Surveying I	3		5		8	20	80	3	60	40	4	200	
3	EG 2102 CE	Applied Mechanics	3	2		2/2	6	20	80	3	25			125	
4	EG 2103 CE	Basic Hydraulics	3	1		2/2	5	20	80	3	25			125	
5	EG 2104 CE	Building Construction	5	1	1	2/2	8	20	80	3	30	20	3	150	
6	EG 2105 CE	Construction Drawing			4		4				60	40	4	100	
7	EG 2106 CE	Computer Aided Drafting	2		3		5	10	40	1.5	30	20	3	100	
TOTAL			19	5	13	3	40	110	440		230	120		900	

YEAR: II

SEMESTER II

S.N.	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
			L	T	P	Lab		Theory			Practical				
								Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	EG 2206 SH	Social Studies	2				2	10	40	1.5				50	*Continuous assessment
2	EG 2201 MG	Management	3				3	20	80	3				100	
3	EG 2201 CE	Surveying II	3		5		8	20	80	3	60	40	4	200	
4	EG 2202 CE	Estimating and Costing I	3		4		7	20	80	3	60	40	4	200	
5	EG 2203 CE	Mechanics of Structure	4	2		2/2	7	20	80	3	25			125	
6	EG 2204 CE	Soil Mechanics	4	2		2/2	7	20	80	3	25			125	
7	EG 2205 CE	Water Supply Engineering	4	1		2/2	6	20	80	3	25			125	
TOTAL			23	5	9	3	40	130	520		195	80		925	

Curriculum Structure of Diploma in Civil Engineering

YEAR: III

SEMESTER I

S.N	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
			L	T	P	Lab		Theory			Practical				
								Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	EG 3101 CE	Surveying III	3		3		6	20	80	3	30	20	3	150	*Continuous assessment
2	EG 3102 CE	Estimating and Costing II	3		4		7	20	80	3	60	40	4	200	
3	EG 3103 CE	Structural Design and Drawing	5	3	2		10	20	80	3	30	20	3	150	
4	EG 3104 CE	Highway Engineering I	3	1			4	20	80	3				100	
5	EG 3105 CE	Sanitary Engineering	3	1			4	20	80	3				100	
6	EG 3106 CE	Construction Management	4	1			5	20	80	3				100	
7	EG 3107 CE	Minor Project (Survey Camp)			4		4				60	40	4	100	
TOTAL			21	6	13		40	120	480		180	120		900	

YEAR: III

SEMESTER II

S.N	Code No.	Subjects	Mode				Total Hours	DISTRIBUTION OF MARKS						Total Marks	Remarks
			L	T	P	Lab		Theory			Practical				
								Assmt. Marks	Final Marks	Time Hours	Assmt. Marks*	Final Marks	Time Hours		
1	EG 3201 MG	Entrepreneurship Development	3		2		5	20	60	3	10	10	1.5	100	*Continuous assessment
2	EG 3202 CE	Highway Engineering II	3	1		2/2	5	20	80	3	25			125	
3	EG 3203 CE	Estimating and Costing III	3		3		6	20	80	3	30	20	3	150	
4	EG 3204 CE	Irrigation and Drainage Engineering	4	2	2		8	20	80	3	30	20	3	150	
5	EG 3205 CE	Major Project			10		10				120	80	4	200	
6	EG 3206 CE	Elective (One of the followings)	3		3		6	20	80	3	30	20	3	150	
		A: Trail Bridge													
		B: Hill Road													
		C: Hill Irrigation Engineering													
		D: Gravity Flow Water Supply System													
		E: Rural/Agriculture Road													
TOTAL			16	3	20	1	40	100	380		245	150		875	

First Year
(First and Second Semesters)

First Semester

Subjects:

- 1 EG 1101 SH Communication Nepali
- 2 EG 1102 SH Communication English
- 3 EG 1103 SH Engineering Mathematics I
- 4 EG 1104 SH Engineering Physics I
- 5 EG 1105 SH Engineering Chemistry I
- 6 EG 1101 CE Workshop Practice I
- 7 EG 1101 AR Engineering Drawing I

कम्युनिकेसन नेपाली
ई.जी. १९०९ एस.एच.

वर्ष : प्रथम
सेमेष्टर : प्रथम

जम्मा : २ घण्टा/ हप्ता
प्रवचन : २ घण्टा/ हप्ता:
विशेष : घण्टा/ हप्ता:
प्रयोगात्मक : घण्टा/ हप्ता:
प्रयोगशाला : घण्टा/ हप्ता:

कोर्सको 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 ।

कोर्सको 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 ।

पाठ्यांशको विषयवस्तु

एकाइ १ संचारात्मक नेपाली भाषा

[७ घण्टा]

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 घण्टा]

२.१ बोध, बुँदाटिपोट, सङ्क्षेपीकरण र शब्दभण्डारको ज्ञान र अभ्यास

- अनुच्छेद लेखन
- संवाद लेखन
- बुँदा लेखन
- सारांश लेखन
- पत्र लेखन (निमन्त्रणा पत्र, सूचना, सम्पादकलाई चिठी र निवेदन आदि)

- निबन्ध लेखन
- प्राविधिक तथा पारिभाषिक शब्दहरूको ज्ञान र प्रयोग
- २.२ **शब्द निर्माणको अभ्यास**
 - उपसर्ग
 - प्रत्यय, (कृत् तथा तद्धित)
 - समास
- २.३ **प्राविधिक/पारिभाषिक शब्दहरूको शब्दस्रोत,**
 - वर्णविन्यास (प्राविधिक शब्दका सन्दर्भमा आवश्यक मात्र)
 - अर्थ र व्युत्पत्तिका लागि शब्दकोशको प्रयोगको अभ्यास
- २.४ **प्रतिवेदन लेखन**

एकाइ ३ कृति परिचय

[५ घण्टा]

निम्न लिखित ढाँचामा तलका कृतिको परिचय लेख्ने अभ्यास

- ३.१ **कृतिहरू:**
 - सौर्य उर्जा
 - ट्रेड कोर्ष (कालिगढ तालिम) : एक परिचय : इ.अ.सं. पश्चिमाञ्चल क्याम्पस पोखरा ।
 - भुकम्पबाट सुरक्षित रहन गर्नु पूर्व तयारी: भूकम्प प्रविधि राष्ट्रिय समाज नेपाल ।
 - इन्जिनियरिङ नेपाली: लालानाथ सुवेदी ।
 - सिंचाई प्रविधि ज्ञान : भोजराज रेग्मी, त्रि. वि. पाठ्यक्रम विकास केन्द्र
- ३.२ **कृति परिचयको ढाँचा**
 - कृतिको नाम:
 - कृतिकारको नाम:
 - कृतिका मुख्य विषय: (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)

सिकाई सामग्रीहरू

- त्रि. वि. पाठ्यक्रम विकास केन्द्र, अनिवार्य नेपाली शिक्षण निर्देशन, काठमाण्डौं
- लालानाथ सुवेदी, इन्जिनियरिङ 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

Year: I
Semester: I

Total: 2 hour /week
Lecture: 2 hours/week
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. Communicate in English language at work/job environment;
2. Define and use trade related technical terminologies;
3. Demonstrate various writing skills related to the job and
4. Demonstrate situational/structural conversation essential for job performance.

Course Contents:

Unit 1. Communicative English:

[3 Hours]

- 1.1. The structure of English:
 - Introduction
 - Grammatical units:
 - The word
 - The phrase
 - The clause
 - The sentence
 - The grammatical structures:
 - The structure of the phrase
 - The structure of the clause
 - The structure of sentence (functions)
 - The structure of sentence (realizations)
- 1.2. Everyday functions.
- 1.3. Requests and offers.
- 1.4. Direct functions.
- 1.5. Asking about / expressing.
- 1.6. Asking about / stating.
- 1.7. Functions of English.
- 1.8. Using dictionary
- 1.9. Reading comprehension
- 1.10. Collection and definitions of trade related terminologies

Unit 2.	Writing skills in English:	[15 Hours]
2.1	Writing paragraphs	
2.2	Writing dialogues	
2.3	Writing Précis	
2.4	Writing summaries	
2.5	Writing letters:	
	▪ Applications	
	▪ Official letters	
	▪ Business letters	
	▪ Invitation letters	
2.6	Writing essays	
2.7	Writing reports:	
	▪ General reports	
	▪ Technical reports	
	▪ Needs assessment reports	
	▪ Review reports	
2.8	Writing resumes	
2.9	Writing bibliographies	
2.10	Writing minutes	
2.11	Writing notes	
2.12	Writing proposals:	
	▪ Technical proposals	
	▪ Academic proposals	
2.13	Writing for action	
2.14	Writing for job	
2.15	Writing technical articles:	
2.16	Using technical journals/articles	
2.17	Writing instructions	
2.18	Introduction to writing technical manuals	
2.19	Writing memos	

Unit 3.	English Sounds and Structures:	[4 Hours]
3.1	Definitions of phonology, sounds of English, morphology, lexicology, syntax, and semantics	
3.2	Sounds of English:	
	▪ The vowels	
	▪ The consonants	
	▪ Consonant clusters	
	▪ Vowel sequences	
	▪ Syllable structure	
	▪ Stress	
	▪ Intonation	

Unit 4. English Conversation Practices and Guidance:

[8 Hours]

- 4.1. Situational conversation
- 4.2. Structural conversation
- 4.3. Familiarization with English spoken skills for employment during the stage of visa application to workstation in abroad.
- 4.4. Guidance for:
 - TOEFL preparation
 - IELTS preparation
 - Group discussion and presentation
 - Seminar conduction

Learning materials:

1. Poudel, R.C., A Manual to Communicative English, K.P.Pustak Bhandar, Kathmandu, 1956/57.
2. Shah ,B.L.,Atext 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. 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.
8. 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

Year: I
Semester: I

Total: 5 hours /week
Lecture: 4 hours/week
Tutorial: 1 hour/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 and
4. Sets, limit and continuity, derivatives, integration and integrals.

Course Contents:

Unit 1.	Trigonometry:	[16 Hours]
1.1.	Review of trigonometric ratios: <ul style="list-style-type: none">▪ Basic trigonometric formulae▪ Identities and conditional identities.	
1.2.	Trigonometric equations: <ul style="list-style-type: none">▪ Periodicity of trigonometric functions▪ General solutions of the following equations:<ul style="list-style-type: none">• $\sin x = k$, $\cos x = k$ and $\tan x = k$ and using trigonometric equations.	
1.3.	Inverse circular functions: <ul style="list-style-type: none">▪ Domain and their graphs▪ Formulae involving inverse circular functions▪ Simple identities and equations involving circular functions	
1.4.	Properties of triangles: <ul style="list-style-type: none">▪ 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	

Unit 2.	Coordinate Geometry:	[16 Hours]
2.1	Straight lines: <ul style="list-style-type: none"> ▪ 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	Angle between two lines: <ul style="list-style-type: none"> ▪ 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: <ul style="list-style-type: none"> ▪ Standard equation ▪ General form ▪ Tangents and normal 	
2.4.	Parabola: <ul style="list-style-type: none"> ▪ Standard equation ▪ Tangents and normal 	
Unit 3.	Algebra:	[8 Hours]
3.1.	Progressions: <ul style="list-style-type: none"> ▪ A.P., G.P. and H.P. 	
3.2.	Permutations and combinations	
3.3.	The binomial theorem for any index	
3.4.	Series: <ul style="list-style-type: none"> ▪ Exponential & logarithmic 	
3.4.	Equations: <ul style="list-style-type: none"> ▪ Quadratic & polynomial 	
Unit 4.	Calculus:	[20 Hours]
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.	
4.7.	Limit of community.	
4.8.	Derivatives from definition of simple functions like: <ul style="list-style-type: none"> ▪ x^n, $(ax+b)^n$, $\sin(ax + b)$, e^{ax}, a^x, and $\log x$. 	
4.9.	Derivatives of sum, difference, product and quotient of functions, chain rule, parametric and implicit functions	
4.10.	Integration, Rules for finding integrals.	
4.11.	Standard integrals and their uses.	

- 4.12. Definite integrals- definition and evaluation.
- 4.13. Definite integral as limit of sum.

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 Physics I

EG 1104 SH

Year: I
Semester: I

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: 1 hour/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:

Theory

Unit 1. Mechanics:

[14 Hours]

- 1.1 Basic units and measurements:
 - Measurement of physical quantities
 - Introductory ideas about dimensions of physical quantities.
 - Scalar and Vector: definitions and examples, dot and cross product of two vectors
 - Composition and resolution 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 and banked track
- 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.
- 1.5. Work, energy, and power:
 - Definition and units of work, energy and power.
 - Potential and kinetic energy.
 - Conservation of energy.
 - Conservative forces.
 - Transformation of energy.
 - Power efficiency.
- 1.6. Simple harmonic motion (SHM):
 - Simple harmonic motion and its characteristics.
 - Period, frequency, and amplitude of simple harmonic motion.
 - Speed and acceleration in simple harmonic motion.
 - Energy of simple harmonic motion.
 - Simple pendulum.
- 1.7. 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.

Unit 2. Heat and Thermodynamics:

[11 Hours]

- 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.
 - 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.
 - Barometric height correction.
- 2.4 Heat Transfer:
- Thermal conduction conductivity and determination of the coefficient of thermal conductivity.
 - Convection and convection coefficient.
 - 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,
 - isothermal and
 - Isobaric.
 - Specific and molar heat capacities for different thermodynamic processes, $C_p - C_v = R$.
 - Second law of thermodynamics.
 - Carnot engine, Otto cycle and their efficiencies.

Unit 3. Optics:

[10 Hours]

- 3.1 Light and Illumination:
- Nature of light, sources of light, rays.
 - Luminous flux.
 - Luminous intensity of a point source.
- 3.2 Reflection and Refraction by plane Surfaces:
- Review of reflection and refraction by plane surfaces.
 - Speed of light in different media.
 - Deviation due to reflection and refraction.
 - Phenomenon of total internal reflection, critical angle.
 - Real and apparent depth.

- Determination of reflective index.
- 3.3 Reflection by Spherical Surfaces:
 - Review of reflection by spherical surfaces.
 - Method of construction of image by ray diagrams.
 - Real and virtual images.
 - Nature of images formed by spherical mirrors.
 - Spherical aberration: parabolic mirror.
 - Uses of Mirrors: driving mirror of a car, field of view.
- 3.4 Refraction through Prisms and Lenses:
 - Deviation due to prism and minimum deviation.
 - Refraction through lenses.
 - Lens maker equation.
 - Converging lens, diverging lens and thin lens equation.
 - Formation of images by lenses.
 - Combination of lenses.
 - Magnification,
 - Power of a lens.
 - Uses of lenses:
 - simple microscope,
 - compound microscope and
 - Telescope
 - Human eye.

Unit 4. Magnetism:

[10 Hours]

- 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.
 - Deflection and oscillation magnetometer.
- 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.
 - Hysteresis

Practical (Laboratory)

[30 Hours]

1. Determine volume of hollow 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. 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

Year: I
Semester: I

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: 1 hour/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 and
3. System of classification.

Course Contents:

Theory

Unit: 1: General Chemistry:

[8 Hours]

- 1.1 Atom and molecule:
 - Definition
 - Dalton's atomic theory and modern position of the theory
- 1.2 Atomic weight:
 - Definition
 - Determination of atomic weight by Dulong and Petit's method and Related numerical problems
- 1.3 Molecular Weight:
 - Definition
 - Avogadro's hypothesis
 - Application of Avogadro's hypotheses (Mol. Wt= $2 \times V.D.$, 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
- 1.4 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)
- 1.5 Simple mole concept:
- Mole of an atom
 - Mole of a molecule
 - Molar volume and
 - Simple calculation on mole concept

Unit: 2: Language of Chemistry: [4 Hours]

- 2.1 Symbol:
- Definition
 - Significance (qualitative and quantitative)
- 2.2 Formula:
- Definition
 - Significance (qualitative and quantitative)
 - Concept of valency in terms of combining capacity with H₂, O₂, and Cl₂
 - Variable valency (ref. Fe, Sn, Pb, Cu, Hg, S and N)
 - Radicals (electro- positive and electro - negative)
 - Writing a formula
- 2.3 Chemical equation:
- Definition
 - Types requisites
 - Significance and limitation
 - Balancing of chemical equation by hit and trial method and Partial equation method

Unit: 3: System of Classification: [33 Hours]

- 3.1 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
 - 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
- 3.2 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
- 3.3 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
- 3.4 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
- 3.5 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 Activity and electrochemical series:
- Definition,
 - Action of water, acid and oxygen on metals.
- 3.7 Corrosion:
- Definition
 - Types
 - Direct and indirect method and prevention against corrosion
- 3.8 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
 - Preparation of acid and base (at least 2 -methods).
 - Properties of acid and base.
 - Definition of Salt
 - Types of salt (normal, acidic and basic)
 - Preparation of salt (at least 3 - methods)
 - Concept of hydrogen ion concentration, pH value and pH Scale
 - Buffer solution.

- 3.9 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

Practical (Laboratory)

- | | | |
|-----|---|-----------|
| 1. | Simple Glass Working | [6 Hours] |
| | 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 Hours] |
| 3. | To separate sand and calcium carbonate in pure and dry state from the mixture of sand and calcium carbonate | [2 Hours] |
| 4. | To prepare pure water from supplied impure water by distillation and to test the purity of the sample prepared | [2 Hours] |
| 5. | To neutralize dilute sulphuric acid with sodium carbonate solution, and to recover crystals of sodium sulphate | [2 Hours] |
| 6. | To obtain pure and dry precipitate of barium sulphate by treating excess of dilute sulphuric acid with barium chloride solution | [2 Hours] |
| 7. | To investigate the composition of water by electrolysis by using Hofmann's apparatus | [2 Hours] |
| 8. | To determine the equivalent weight of reactive metal by hydrogen displacement method. | [2 Hours] |
| 9. | To determine the pH of different unknown solution and using pH paper and universal indicator | [2 Hours] |
| 10. | To prepare primary standard solution of sodium carbonate and to use it to standardize an approximate decinormal acid solution | [2 Hours] |
| 11. | To standardize given unknown acid (Approx N/10) solution by preparing standard alkali solution. (Expression of strength in different ways) | [2 Hours] |
| 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 Hours] |
| 13. | To carry out conductivity experiments on solids and liquids (CuSO ₄ , Zn, Mg, Al, Fe, CCl ₄ , C ₆ H ₆ , C ₂ H ₅ OH) | [2 Hours] |

Textbooks:

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

References:

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

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

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.

Workshop Practice I

EG 1101 CE

Year: I
Semester: I

Total: 12 hours /week
Lecture: 2 hours/week
Tutorial: hours/week
Practical: 10 hours/week
Lab: hours/week

Course description:

This course intends to impart basic knowledge and skills on bricklaying and plumbing works.

Course objectives:

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

1. Understand the basic concept of brick laying;
2. Understand the basic concept of household plumbing;
3. Perform different bricklaying works and
4. Learn simple plumbing joining and installation works.

Part 1: Bricklaying

Total: 6 hours /week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 5 hours/week

Course description:

This part of the course focuses on familiarization of bricklaying and its standard requirements to be used on to-days construction. It also deals with pointing and curing works.

Course objectives:

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

1. Understand the concept of bricklaying;
2. Identify major operation related to civil engineering works;
3. Identify and select the tools and equipment required for bricklaying and
4. Perform different bricklaying works on different bonding patterns.

Course Contents:

Theory

Unit 1 Introduction of Bricklaying:

[1 Hour]

- 1.1. History of Bricklaying
- 1.2. Importance of Bricklaying
- 1.3. Scope of Bricklaying

- 1.4. Types of Walling (Bricklaying)
- 1.5. Beauty of Bricklaying (Aesthetics of Bricklaying)

Unit 2 Observation of Safety Precaution: [1 Hour]

- 2.1. Use of protective clothing and equipments
- 2.2. Demonstration of safe working habits
- 2.3. Maintaining tools and equipment
- 2.4. Awareness of personal safety and safety of others in all aspects of works
- 2.5. Observation of workshops safety rules and regulations
- 2.6. Fire safety and electrical shocks protection

Unit 3 Identifying Bricklaying Materials: [2 Hours]

- 3.1. Identifying Bricks in common use
- 3.2. Identifying Bricks in Chinese bricks/Dachi Bricks
- 3.3. Identifying Bricks in hand made bricks
- 3.4. Identifying Bricks in 5% cement added sun dried soil bricks
- 3.5. Identifying various types of tiles used in flooring and paving outside of buildings
- 3.6. Identifying sand used in Bricklaying
- 3.7. Identifying Lime/Cement used in Bricklaying
- 3.8. Identifying Portland cement used in Masonry
- 3.9. Identifying amount of water used in mixing Mortar/concrete
- 3.10. Identifying admixture and their properties.

Unit 4 Proper use of Hand Tools: [1 Hour]

- 4.1. Bricklaying Hand tools :- trowel, pointing trowel, plum bob, spirit level, line and pin/corner block, Mason's line, Straight edge/storey rod, Gang rod, Club Hammer, Bolster and closer or bat gauge etc.

Unit 5 Proper use of Bricklaying Equipment/Machines: [1 Hour]

- 5.1. Shovel, spade, wheel barrow, buckets, jugs, sponge, Hesign Rags, Foam, Runner/Joiner, Mortar Boards, Mortar pan and Brooms for cleaning floor
- 5.2. Protective equipment e.g. Hand gloves Goggles ear plugs and Mask etc
- 5.3. Mortar mixer, electric drill and bits, rope and nails
- 5.4. Bamboo and rope
- 5.5. Tubular scaffolding pipe and fittings

Unit 6 Constructing Walls using Bricks in lime mortar English Bond: [2 Hours]

- 6.1. Building ½ Brick (4.5" thick wall) to stretcher Bond
- 6.2. Building 1 Brick (9" thick wall) to English Bond
- 6.3. Building 1.5 Brick (14" thick wall) to English Bond
- 6.4. Building 2 Brick (18" thick wall) to English Bond

Unit 7 Constructing Walls in Various types of Bond: [2 Hours]

- 7.1. Flemish Bond-1 Brick thick, 1.5 Brick and 2 brick thick double Flemish bond wall.
- 7.2. Making of one end stopped and other end racked back.

- 7.3. Constructing cavity wall, 12" thick making cavity of 3" wide.
- 7.4. Constructing rat trap bond 1 brick thick (9" thick wall)

Unit 8 Demonstrating various Types of Bond: [2 Hours]

- 8.1. Function of Bond
- 8.2. Bond types
- 8.3. Design of Bond patterns
- 8.4. Designs of wall faces showing various wall textures
- 8.5. Design of wall faces using various types of bricks

Unit 9 Demonstrating various Types of Pointing: [1 Hour]

- 9.1. Mortar for pointing/Ratio and proportion
- 9.2. Pointing procedure
- 9.3. Pointing as the work proceeds
- 9.4. Pointing after the Brick work is completed
- 9.5. Types of pointing:
 - (a) flush pointing
 - (b) Struck joint or pointing
 - (c) Weather struck and cut pointing
 - (d) Rounded or tooled pointing
 - (e) Recessed pointing
 - (f) Tuck pointing
 - (g) V-joint pointing
 - (h) Purpose of pointing
 - (i) Advantage of pointing.

Unit 10 Curing Walls: [1 Hour]

- 10.1. Curing wall both side by water pouring from top
- 10.2. Curing wall both side by sprinkling water at face
- 10.3. Temporary covering wall by heavy rain, frost and dirty materials nearby building operation
- 10.4. Liquid curing in hot climate
- 10.5. Cleaning wall by chemicals and acids

Unit 11 Building Foundation Footing Courses Wall (Square footing): [1 Hour]

- 11.1. 2.5 Bricks*2.5 Bricks square footing
- 11.2. 3.5 Bricks*3.5 Bricks square footing
- 11.3. 3.0 Bricks*3.0 Bricks square footing
- 11.4. Purpose and advantage of foundation footing

Practical

Project-1

Identify/enumerate/ handle tools/equipments/materials related to bricklaying. [3 Hours]

Project-2

[6 Hours]

- 2.1. Prepare workshop floor areas
- 2.2. Set out work area
- 2.3. Position materials/tools
- 2.4. Prepare mortar

Project -3

[8 Hours]

- 3.1. Handle motor, pick up motor, handling brick trowel properly positioning yourself, layout line spread motor, furrow mortar, pick up bricks and lay bricks to line. Watch bond.

Project -4

[6 Hours]

- 4.1. Lay stretcher bond wall making 4 bricks long and 6 courses high using gangue rod properly.

Project -5

[6 Hours]

- 6.1. Build English bond wall 1 brick thick (9") up to 7 courses high to gauge and pointing to appropriate dimensions.

Project -6

[6 Hours]

- 6.1. Build Flemish bond wall up to 6 courses high to gauge and pointing to appropriate dimensions.

Project -7

[10 Hours]

- 7.1. Build 1.5 brick thick (14") wall to English bond return corner of English bond. One end ranked back and other end completely stopped as per given dimensions, up to five courses high.

Project -8

[6 Hours]

- 8.1. Build a T-junction wall of English Bond pattern as per given dimensions up to 6 courses high.

Project -9

[12 Hours]

- 9.1. Construct cavity wall showing 3" thick cavity using butterfly wall ties providing cavity clean using cavity clean batten or board, dry bond only.

Project -10

[12 Hours]

- 10.1. Construct a rattrap bond wall making 9" thick (1 brick thick wall) up to 6 courses high showing internal trap clear, dry bond only.

References:

1. Brick work vol 1 -W.G. Hash, A.L.O.B. M.R.S.H, Senior lecturer in building Collage of Technology Southampton, England, Hutchinson Technical Education Press.
2. गारो लगाउने प्रविधि- मोहनमान व्यञ्जनकार

Part II: Plumbing

Total: 6 hours /week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 5 hours/week

Courses description:

This part of the course focuses on familiarization of plumbing works related to civil constructions. It also includes basic knowledge and skills on welding and bar bending.

Course objectives:

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

1. Apply operating systems of plumbing works;
2. Identify the tools and equipment required to plumbing works;
3. Perform simple pipe fittings works and
4. Prepare the PVC fittings.

Course Contents:

Theory

Unit 1 Introduction of Plumbing:

[1 Hour]

- 1.1. History of plumbing.
- 1.2. Importance of plumbing
- 1.3. Plumbing and sanitary
- 1.4. Scope of plumbing

Unit 2 Plumber's Hand Tools:

[2 Hours]

- 2.1. Pipe wrench of size 12", 9", and up to 18" long.
- 2.2. Pair of footprints.
- 2.3. Stocks and dies, up to 2" diameter, replacement of cutters
- 2.4. Wrench chain
- 2.5. Hack's saw frame and blade
- 2.6. Measuring tape
- 2.7. Soldering iron
- 2.8. Tin snips
- 2.9. Rasp
- 2.10. Caulking iron
- 2.11. Adjustable wrench up to 12 long.
- 2.12. Claw hammers /Ball pin hammer/Claw hammer
- 2.13. Pipe cutter-use and care adjustment of cutting wheels.
- 2.14. Drilling machine and its bits.
- 2.15. Pipe vise

- 2.16. Bench vice
- 2.17. Spanners of various size
- 2.18. Folding rules metallic/steel
- 2.19. Try square, Vernier caliper joining elements:- Nuts, bolts, washer, pins, screws and rivets and jute/pipe tape and lead.

Unit 3 Galvanized Pipe Fittings/PVC fittings: [2 Hours]

- 3.1. G.I pipe nipples
- 3.2. G.I. elbows
- 3.3. G.I tee
- 3.4. G.I cross
- 3.5. G.I reducing elbow
- 3.6. G.I reducing tee and reducing cross
- 3.7. G.I sockets
- 3.8. G.I reducing sockets
- 3.9. G.I lock nut
- 3.10. G.I plugs or caps
- 3.11. Flange unions (Gasket)
- 3.12. G.I gate valve (heavy and light)
- 3.13. Foot valve/Glove valve
- 3.14. Pipe tape
- 3.15. Float valve or ball valve.

Unit 4 Pipe Threading to Dimension: [2 Hours]

- 4.1. Fixing pipe to pipe vice
- 4.2. Measuring pipe to millimeter
- 4.3. Measuring methods
- 4.4. Die holding/threading methods
- 4.5. Die checking/cleaning/oiling
- 4.6. Die tightening and loosening/fixing cutter
- 4.7. Checking accurate threading and its sharpness
- 4.8. Doing loosen the die fixing the pipe to die and repeat the threading twice for sharpness.
(Repeat)

Unit 5 Assembling the Threaded Pipe to Fittings with Pipe Tape as per Drawing: [2 Hours]

- 5.1. Visualization of drawing in detail
- 5.2. Collecting the fittings
- 5.3. Collecting the threaded pipes in position
- 5.4. Fixing the fittings with pipe tape to pipe in position
- 5.5. checking the tightness/testing pipe joints
- 5.6. Adjusting measurement
- 5.7. Marking, laying, using chalk line to wall/floor/ceiling
- 5.8. Accurate pipe cutting with margin of necessary threads to pipe
- 5.9. Fixing pipe to pipe vice
- 5.10. Positioning techniques.

Unit 6 Making up H.D.P fittings: [2 Hours]

- 6.1. Definition of HDP pipe and fittings
- 6.2. Collecting hot plate with power
- 6.3. Collecting HDP pipe with necessary diameters
- 6.4. using miter box cutting pipe to 90⁰
- 6.5. Clean, trim and weld the two halves of pipe to form 90⁰ elbow (L)
- 6.6. Making Tee
- 6.7. Making Wyes (Y)

Unit 7 Introduction of Welding: [2 Hours]

- 7.1. Electric power needed for welding
- 7.2. Welding rods
- 7.3. Welding safety rules
- 7.4. Arc welding equipments, accessories and protective gear
- 7.5. Welding Techniques
- 7.6. Types of welding
- 7.7. Principles of gas opening and its use
- 7.8. Gas welding techniques
- 7.9. Forging techniques

Unit 8 Bar Bending Works: [1 Hour]

- 8.1. Straight making bars methods
- 8.2. Bar tying methods.
- 8.3. Categories of bars, e.g. Mild steel bar T.O.R steel bar and TORKARI bars.
- 8.4. Making L(Hook) procedure to Hook making die and bench
- 8.5. Making 45 degrees crank procedure
- 8.6. Making chair to fix reinforcement methods
- 8.7. Making overlaps to steel bars.

Unit 9 Fixing or Fastening Rods to Wire: [1 Hour]

- 9.1. Single knot tying to slab methods
- 9.2. Double knot tying to slab methods
- 9.3. Tying to beam methods
- 9.4. Tying to column methods
- 9.5. Checking tightness of stirrups to main bar loops
- 9.6. Making stirrups or rings

Practical

1. Identify/enumerate/use hand tools and equipments [3 Hours]
2. Demonstrate pipes, plates to shape and size. [3 Hours]
3. File to clean pipe end (mouth). [3 Hours]

4. Cut/thread G.I pipe to given dimensions. [4 Hours]
5. Make nipples to appropriate standard. [2 Hours]
6. Make and assemble using various pipes as Elbow, Union and tee in a Rectangular Loop. [4 Hours]
7. Cut /join H.D.P. pipe and PVC pipe. [4 Hours]
8. Make L, cross and T bends project of PVC pipe [4 Hours]
9. Join PVC fittings with PVC pipe. [4 Hours]
10. Install PPR pipe with fittings. [4 Hours]
11. Install CPVC pipe with fittings. [4 Hours]
12. Perform internal (below ground level) pipe layout and assembling fittings using pipe tape for water supply or sanitation works. [12 Hours]
13. Perform external (wall) pipe layout and joining fittings for water supply. [12 Hours]
14. Tie reinforcement of 12 mm ϕ rods of tor steel @ 6" c/c spacing for a basement RCC footing slab of 1 mx1m size showing 15cm (L) at its ends, and tie the rods in a double knot method. [6 Hours]
15. Weld two plates of 10 mm thick together making butt joint, do filing on it. [6 Hours]

References:

1. Birdie G.S., Birdie J.S. *Water Supply and Sanitary Engineering*,
2. Deolakar S.G., *Plumbing Design and Practice*, Tata Mc Graw-Hill Publishing Company Limited, 1994.
3. McConnell, Charles, *Plumbers and pipe Fitters Library, volume I, II, and III*, Macmillan Publishing Company, 1986.
4. Plumbing practice – book (vol. 1) by James D. Taylor, I.L.O. expert 1975.

Engineering Drawing I

EG 1101 AR

Year: I
Semester: I

Total: 5 hours /week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 4 hours/week
Lab: hours/week

Course description:

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

General objectives:

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

1. Handle drawing instruments and materials;
2. Identify Geometrical construction and shape;
3. Describe the scale, its type and construction;
4. Draw different types of engineering curves and
5. Draw and interpret the multi view of solids with scale and dimensioning.

Course Contents:

Theory

Unit 1: Introduction of Engineering Drawing: [2 Hours]

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

Unit 2: Lettering, scales and dimensions: [1 Hour]

2.1 Lettering

- 2.1.1 Introduction of single stroke letter and their ratio between height and breadth.
- 2.1.2 Introduction of upper and lower case letter.
- 2.1.3 Introduction of Vertical and inclined (*italic*) letter (with inclined angle).
- 2.1.4 Practical exercise of letter writing using the guide lines of vertical and italic letter, (Sheet No 2).

2.2 Scale [1.5 Hours]

- 2.2.1 Introductions of scale and importance
- 2.2.2 Types of scale (full, reducing and enlarge)
- 2.2.3 Construction of scale using the representative factor.

2.3 Dimensioning [1.5 Hour]

- 2.3.1 Introduction of dimensioning.
- 2.3.2 Terminology of dimensioning i. e. Dimension line, extension line leaders line etc.
- 2.3.3 Termination of dimension line using arrowhead, slash and dot.
- 2.3.4 Dimensioning system-Aligned system, unidirectional system and base line dimensioning.
- 2.3.5 Principles of dimensioning.
- 2.3.6 Dimensioning pictorial views and orthographic view

Unit 3: Geometrical constructions: [2 Hours]

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

3.2 Division

- 3.2.1 Division of line – Bi-section of line, tri-section of line, division of line in any number of parts and division of the line in proportionally
- 3.2.2 Division of circle- Division of circle in three, four, five, six, seven and eight parts.
- 3.2.3 Division of angle- bi-section and trisection.
- 3.2.4 Division of triangle and trapezium in any number of equal parts of area.
- 3.3 Construction of triangle, square and regular polygons.
- 3.4 Inscribing and describing of circle in/on triangle or polygons.
- 3.5 Tangency- open and crossed line tangent, Arc tangent –internal, external and combined Arc tangent.

Unit 4: Engineering Curve: [1 Hour]

Introduction of following curves:

- 4.1 Involutives
- 4.2 Spiral
- 4.3 Cycloid
- 4.4 Helices

Unit 5: Conic- Section: [1 Hour]

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

Unit 6: Orthographic Projection:

6.1 Introduction of orthographic projection [2 Hours]

- 6.1.1. Theory of projection
- 6.1.2. Four quadrant, plane of projection
- 6.1.3. Introduction of co-ordinate or three dimensional axis
- 6.1.4. System of orthographic projection

- 6.1.5. Making of orthographic view
- 6.1.6. Analysis of object and its view
- 6.2 Point and line projection [0.5 Hour]**
- 6.2.1. Notation system on HP, VP and PP
- 6.2.2. Location of point /line i, e. where it is and projection on plane of projection
- 6.2.3. Position of line:- Perpendicular to one plane and parallel to the other, parallel to both plane and inclined to one or both planes
- 6.3 Plane projection [0.5 Hour]**
- 6.3.1. Perpendicular to one plane and parallel to the other, perpendicular to both planes, perpendicular to one plane and inclined to the other
- 6.4 Projection of solids [2 Hours]**
- 6.4.1. Orthographic projection of geometrical solid i.e. prism, cylinder and cone in simple Position.(simple position means axis- perpendicular to one plane(HP) and parallel to (VP) axis parallel to both planes
- 6.4.2. Orthographic projection of different model or work pieces. (at least 10 to 15 model pieces)

Practical (Class work sheet)

Sheet No: 1 [6 Hours]

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

Sheet No: 2 [6 Hours]

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

Sheet No: 3 [3 Hours]

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

Sheet No: 4 [9 Hours]

1. Perform Line- bisection, trisection, line division any number of parts, with proportional division, circle division in three, four five, six, seven and eight parts, area of triangle and trapezoid division any number of equal parts.

2. Construct triangle by given sides, making equilateral triangle/square and regular Polygons (pentagon, hexagon, heptagon etc.)
3. Find the centre of Arc, making the circle touching the three points. Describing the circle on triangle, inscribe the circle in right angle triangle, Equilateral triangle, and scalene triangle and inscribing the circle in a sector.
4. Draw tangent from any point on circle, open and crossed line (belt) tangent. Arc Tangent-Internal, External and combined.

Sheet No: 5

Draw:

[6 Hours]

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

Sheet No: 6

Draw:

[6 Hours]

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

Sheet No: 7

Perform/draw:

[6 Hours]

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

Sheet No: 8

Perform/draw:

[3 Hours]

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

Sheet No: 9

Perform/draw:

[3 Hours]

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

Sheet No: 10

[12 Hours]

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

References:

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

Second Semester

Subjects:

- | | | |
|---|------------|----------------------------|
| 1 | EG 1201 SH | Engineering Mathematics II |
| 2 | EG 1202 SH | Engineering Physics II |
| 3 | EG 1203 SH | Engineering Chemistry II |
| 4 | EG 1201 CE | Workshop Practice II |
| 5 | EG 1202 CE | Engineering Materials |
| 6 | EG 1201 AR | Engineering Drawing II |
| 7 | EG 1211 CT | Computer Application |

Engineering Mathematics II

EG 1201 SH

Year: I
Semester: II

Total: 4 hours /week
Lecture: 3 hours/week
Tutorial: 1 hour/week
Practical: hour/week
Lab: hour/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 and
7. Explain the concepts of statistics and apply them in the field of the related engineering area.

Course Contents:

Unit 1.	Vectors:	[5 Hours]
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 Hours]
	<ul style="list-style-type: none"> 2.1. Complex number in the form $A + ib$. 2.2. Algebra of complex numbers. 2.3. Polar representation of complex numbers. 2.4. De Moivre's theorem and its applications 2.5. Linear inequalities and their graphs. 2.6. System of linear inequalities in two variables, 2.7. System of linear inequalities in two variables, 2.8. Linear programming: Problems involving two variables under given linear constraints 2.9. Determinants and matrices, 2.10. Algebra of matrices, 2.11. Properties of determinants, 2.12. Ad joint and inverse of matrices. 2.13. Solution of linear equations using cramer's rule 2.14. Row equivalent matrices 2.15. Idea of polynomial equations 	
Unit 3.	Calculus:	[12 Hours]
	<ul style="list-style-type: none"> 3.1. Applications of derivatives- <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Curve tracing, maxima and minima • Rieman sums & integral • Application of fundamental theorem 	
Unit 4.	Geometry:	[4 Hours]
	<ul style="list-style-type: none"> 4.1. Coordinates in space, 4.2. Coordinates in planes. 	
Unit 5.	Statistics:	[9 Hours]
	<ul style="list-style-type: none"> 5.1. Statistics: <ul style="list-style-type: none"> • Introduction to statistics • Measures of Central Tendency • Measures of Dispersion • Moments, Skewness 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
 - Concept of theoretical probability distribution
- 5.3 Concept of normal curve and normal distribution
- 5.4. Concept of sampling, estimation and tests of significance

Learning materials:

1. A Text book of Statistics – B.C. Bajracharya
2. Elementary Statistics – H. C. Saxena
3. Statistical Methods – Mrigendralal Singh
4. 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.
5. 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

Year: I
Semester: II

Total: 6 hours/week
Lecture: 3 hours/week
Tutorial: 1 hour/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 and
4. Explain the basic concepts related to the modern physics and apply it in the field of the related engineering area.

Course Contents:

Theory

Unit 1. Electricity: [16 Hours]

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.
 - Mechanical measurements:
 - Galvanometer.
 - Ammeter and voltmeter
 - Potentiometer and measurement of emf.
 - Wheatstone bridge
 - Kirchhoff's law and their use to analyze simple circuits.
 - Heating effect of current:
 - Joules law
 - The rate of heating from the concept of p.d.
 - Thermoelectricity:
 - Seebeck effect
 - Peltier effect and
 - Thomson effect.
 - Chemical effect of current:
 - Faraday's law of electrolysis.
 - Accumulator.
- 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 corkscrew 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
 - Magnetic field due to the solenoid or toroid 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 Hours]

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.
- Reflection of sound waves.
- Interference of sound waves.
- Diffraction of 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.
- Diffraction of light waves.
- Huygen's principle.
- Polarization and unpolarized lights, polarization by reflection (Brewster's law)

Unit 3. Properties of Matter: **[10 Hours]**

- 3.1 Elasticity:
- Elasticity, Hook's law, Young's modulus, Bulk modulus.
 - Elasticity of shear.
- 3.2 Surface tension:
- Intermolecular attraction in liquid, surface tension.
 - Cohesion and adhesion, angle of contact.
 - 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, viscous forces at higher relative velocities (qualitative).
 - Temperature dependence of the coefficient of viscosity of liquid and gases.

Unit 4. Modern Physics: **[10 Hours]**

- 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 carriers.
 - Acceptors and donors, p-n junction, diode and depletion layer, forward and reverse bias.
 - Rectifying property of diode, Transistor, transistor action and uses of npn transistor
- 4.3 Nuclear physics:
- Laws of radioactive disintegration: half life, mean life, and decay constant.
 - Stable and radioactive nuclei.
 - Binding energy.
 - Fission and fusion.

Practical (Laboratory)

[30 Hours]

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 (For Both Parts I and II):

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

Supplementary text:

1. College Physics by sears, Zemansky and Young, Fourth edition 1985

Textbooks for laboratory work:

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

Textbooks for numerical problems:

1. Numerical exercise in physics volume I and volume II -
Prepared by Physics Dept., Pulchowk Campus, and published by Institute of Engineering.

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 II

EG 1203 SH

Year: I
Semester: II

Total: 6 hours/week
Lecture: 3 hours/week
Tutorial: 1 hour/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 and
3. Organic compounds and synthetic materials.

Course Contents:

Theory

Unit: 1:	Non-metals and their Compounds:	[20 Hours]
1.1	Water: <ul style="list-style-type: none">▪ 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: <ul style="list-style-type: none">▪ Lab preparation▪ Manufacture by Haber's process▪ Properties and uses	
1.3	Nitric acid: <ul style="list-style-type: none">▪ 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 "Sulphur dioxide")	
1.4	Halogens (Chlorine): <ul style="list-style-type: none">▪ 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 Hours]

- 2.1 General study of metals and their components:
 - 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
- 2.6 Zinc:
 - Properties & uses
- 2.7 Iron:
 - Properties & uses
- 2.8 Lead:
 - Properties & uses
- 2.9 Alloys:
 - Definition
 - Purpose of making alloys
 - Composition,
 - Properties and uses of alloys of steel, aluminum, copper and zinc

Unit: 3: Organic Compounds and Synthetic Materials:**[10 Hours]**

3.1. Organic compounds

- Organic compounds:
 - Historical background, classification, and nomenclature
 - Functional groups and homologous series
- Comparison of aliphatic and aromatic compounds
- Saturated hydrocarbon: Properties of Methane
- Unsaturated hydrocarbon: Properties of Ethylene and Acetylene
- 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

Practical (Laboratory)

- | | | |
|-----|--|-----------|
| 1. | To compare the hardness of different types of water | [2 Hours] |
| 2. | To prepare Bakelite (resin) in the laboratory | [2 Hours] |
| 3. | To determine the condition in which corrosion takes place | [2 Hours] |
| 4. | To investigate the action of acids on some metals (Zn, Mg, Fe, Al, Sn & Cu)(acids:- HCl, H ₂ SO ₄ (dil.)& HNO ₃ (dil) | [2 Hours] |
| 5. | To prepare and study the properties of hydrogen gas | [2 Hours] |
| 6. | To prepare and study the properties of ammonia gas | [2 Hours] |
| 7. | To prepare and study the properties of hydrogen Sulphide gas.
(This gas should not be prepared individually in Woulf bottle but in Kipp's apparatus commonly) | [2 Hours] |
| 8. | To detect the acid radicals (Cl ⁻ , NO ₃ ⁻ , SO ₄ ²⁻ , CO ₃ ²⁻) by dry and wet ways | (4 Hours) |
| 9. | To detect the basic radicals (Cu ⁺⁺ , Al ⁺⁺⁺ , Fe ⁺⁺⁺ , Zn ⁺⁺ , CO ⁺⁺ , Ni ⁺⁺ , Ca ⁺⁺ , Ba ⁺⁺ , Mg ⁺⁺) by wet ways | [6 Hours] |
| 10. | To detect the acid and basic radicals (complete salt analysis) | [6 Hours] |

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

References:

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

Workshop Practice II EG 1201 CE

Year: I
Semester: II

Total: 10 hours /week
Lecture: 2 hours/week
Tutorial: hours/week
Practical: 8 hours/week
Lab: hours/week

Course description:

This course intends to impart basic knowledge and skills on electricity and carpentry works.

Course objectives:

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

1. Understand the basic concept of electricity;
2. Understand the basic concept of wood work;
3. Perform house wiring works and
4. Perform simple wood works.

Part 1: Electricity

Total: 5 hours /week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 4 hours/week

Course description:

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

Course objectives:

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

1. Understand the concept of electricity;
2. Identify electric symbols and accessories;
3. Identify tools/equipment and its safety requirement of wiring system;
4. Identify major components of electrical system and its installation procedure and
5. Connect lighting circuits and signal circuits.

Course Contents:

Theory

Unit 1 Introduction of electricity

[1 Hour]

- 1.1. History of electricity
- 1.2. Generation of electricity
- 1.3. Scope of electricity
- 1.4. Types of current

Unit 2 Fundamentals of electric circuits	[4 Hours]
2.1. Definition of voltage, current, resistance and their relationship	
2.2. Types of conductors	
2.3. Types of circuits	
2.3.1. Series circuit	
2.3.2. Parallel circuit	
2.4 Measurement of current, voltage, resistance and power	
2.4.1. Ampere meter	
2.4.2. Volt meter	
2.4.3. Ohm meter	
2.4.4. Power meter/ Watt meter/Energy meter	
2.5 Related numerical problems on circuits	
Unit 3 Electrical Energy Transformation	[2 Hours]
3.1. Transformer, its function and application	
3.2. Isolator, its function and application	
3.3. Electric poles, its function and application	
3.4. Safety and precautions	
Unit 4 Measuring Instruments and Protecting Devices	[1 Hour]
4.1. Foot and meter/scale (Linear measuring instruments)	
4.2. Vernier caliper/caliper	
4.3. Standard wire gauge	
4.4. Feeler gauge/radius gauge	
4.5. Micrometer/voltmeter	
4.6. Miniature Circuit breaker (MCB)	
4.7. Fuses and fuse types	
4.8. Check line with color chalk dust powder	
4.9. Straightedge and line	
Unit 5 Source of Power	[2 Hours]
5.1. Definition	
5.2. D.C. system	
5.3. A.C. system	
5.4. Phases (single and three phases lines)	
5.5. Inverter system	
5.6. Solar power system	
Unit 6 Electric Symbols	[1 Hour]
6.1. Introduction	
6.2. Types of symbols	
6.3. Identification	
6.4. Application	

Unit 7 Earthing [2 Hours]

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

Unit 8 Electric Wiring Procedure [2 Hours]

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

Practical

Project 1 : Draw/interpret Drawings and Diagrams: [6 Hours]

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

Project 2: Connect Lighting Circuits on Board:

- 2.1. With one-way switch one light and one socket [6 Hours]
- 2.2. With two-way switch two lights and two sockets [6 Hours]
- 2.3. With intermediate switches, two fluorescent lamps [6 Hours]
- 2.4. With multi-position switches and incandescent lamps [9 Hours]
- 2.5. With Dimmer switches and incandescent lamps. [9 Hours]
- 2.6. With time switches and lamps [6 Hours]

Project 3: Connect the Following Signal Circuits:

- 3.1. With electrical bell [4 Hours]
- 3.2. With electric door opener [4 Hours]
- 3.3. Ceiling fan with fan regulator [4 Hours]

References:

- 1. Introduction of Electricity Vol. I, by N.B. Malla
- 2. S. K. Malice, *Electric Trade Theory and Practical*

Part II: Carpentry

Total: 5 hours/week
Lecture: 1 hour/week
Tutorial: hours/week
Practical: 4 hours/week

Course description:

This part of the course focuses on familiarization of carpentry work and its tools and equipment required. It intends to provide knowledge and skills on Timber seasoning, Detecting timber defects and joints and Wood carving techniques.

Course objectives:

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

1. Understand the principles of carpentry works;
2. Select and collect the hand tools required for conduction of carpentry works;
3. Understand the concept on technology of wood and its conversion techniques and
4. Perform shaving and joints making.

Course Contents:

Theory

Unit 1 Introduction of Carpentry: [1 Hour]

- 1.1. Introduction of hand tools/equipment
- 1.2. The importance of tools/equipment in carpentry trade made of stones in stone age
- 1.3. Types of carpentry trades as per
 - 1.3.1. Carpenter
 - 1.3.2. Joiner
 - 1.3.3. Cabinet and furniture maker
 - 1.3.4. Tree cutter and lumber products or (Producer)
 - 1.3.5. Wood working machine setter-operator

Unit 2 Wood as Construction Materials: [1 Hour]

- 2.1. Temporary structure
- 2.2. Structural medium(permanent structure)
- 2.3. Joinery works
- 2.4. Furniture making
- 2.5. Tools handle making
- 2.6. Sport goods
- 2.7. Paper and cardboards
- 2.8. Plywood makings
- 2.9. Miscellaneous works

Unit 3 Tree and its Growth: [1 Hour]

- 3.1. Importance of trees
- 3.2. Enemies of tree
- 3.3. Conservation of forest
- 3.4. Plantation of a tree
- 3.5. How a tree grows
- 3.6. Kinds of trees
- 3.7. Soft wood trees
- 3.8. Hard wood trees
- 3.9. Characteristics of a good timber

Unit 4 Methods Conservations of Lumber (Log): [1 Hour]

- 4.1. Through and through sawn(T and T)
- 4.2. Tangential sawn
- 4.3. Quarter or rift sawn
- 4.4. Cross-sections of a Trunk

Unit 5 Identifying and Enumerating and Hand and Power Tools: [1 Hour]

- 5.1. Different hand tools (Lay Out Tools, Tooth edge cutting tools (Straight line cutting saw, Curve line cutting saw, Saving Tools, Shaping Tools, Drilling and Boring, Striking and Driving)
- 5.2. Different types of power tools
- 5.3. The wood lathe machine

Unit 6 Timber Seasoning: [1 Hour]

- 6.1. Definition of seasoning
- 6.2. Object of seasoning
- 6.3. Methods of seasoning
- 6.4. Calculation of moisture content in timber

Unit 7 Timber Defects: [1 Hour]

- 7.1. The defects caused by shrinkage
- 7.2. The defects caused by nature(Natural)
- 7.3. The defects caused by man made
- 7.4. Reasons of timber decaying

Unit 8 Insects and Wood borers: [1 Hour]

- 8.1. Define Borers?
- 8.2. Identify termites or white ants
- 8.3. Removal of termites
- 8.4. Reason of termites develop in home
- 8.5. Wood preservatives
- 8.6. Hot and cold both method
- 8.7. Pressure method
- 8.8. Defects caused by dampness

Unit 9 Wood Carvings: [1 Hour]

- 9.1. Definition of carvings
- 9.2. Process of carvings(Method)
- 9.3. Illustration of ancient carving of Tundal and Shutters

Unit 10 Painting on Wooden Surfaces: [1 Hour]

- 10.1. Definition of wood primer
- 10.2. Definition of wood varnishes/enamel and chapra (French polish)
- 10.3. Identification of painting brushes/rollers
- 10.4. Safety precautions

Unit 11 Simple and Complicated Wood joints: [1 Hour]

- 11.1. Function of joint
- 11.2. Types of joints(Lengthening, widening and framing joints)
- 11.3. Miscellaneous joints
- 11.4. Types of beam hangers
- 11.5. Use of gusset plates in framings of frame construction
- 11.6. Uses and application of;

A. Lengthening joint [1 Hour]

- a. Table scarf joint
- b. Spliced joint

B. Widening joint [1 Hour]

- a. Butt joint
- b. Tongued and grooved joint
- c. Dowel joint
- d. Tongued and grooved joint with chips

C. Framing joint [0.5 Hour]

- a. Dovetail bridle joint
- b. Tusk tenon joint

D. Rail joint [0.5 Hour]

- a. Stub mortise and tenon joint with hunch
- b. Housing joint

Unit 12 Plywood: [1 Hour]

- 12.1. Definition
- 12.2. Types
- 12.3. Sanding
- 12.4. Properties of plywood

Practical

[60 Hours]

1. Shave timber by hand to the size and shape (size making to the given dimensions)
2. Make cross half lap joint and its function
3. Make dovetail half lap joint and its function
4. Make mortise and tenon joint and its function
5. Make dovetail bridle joint and its function
6. Make a stopped housing joint and its function (stopped dado joint)
7. Make small stool
 - a. use of stool
 - b. materials selection
 - c. joints used
 - d. different component parts
 - e. work procedure
8. Apply putty/primer and varnish to the small stool
 - a. application procedure
 - b. glazing procedure
 - c. safety precaution

पाठ्यपुस्तकहरु :

1. चिनिकाजी स्थापित र केशव दास बैद्य *सिकर्मी व्यवसाय*
2. शिलाकार, दोब्बरलाल, *काष्ठकार्यको परिचय (An Introduction of Wood Work)*, प्रथम संस्करण २०१४ ।
3. Singh Surendra, Engineering Materials (Latest Edition), Vikas Publishing House Pvt. .Ltd.
4. Byanjankar, Mohan Man, The Essential Views in Carpentry and Masonry, Nepal Engineering College, 1996.

Engineering Materials

EG 1202 CE

Year: I
Semester: II

Total: 6 hours /week
Lecture: 5 hours/week
Tutorial: hours/week
Practical: hours/week
Lab: 2/2 hours/week

Course description:

This course is designed to help students on using various construction materials in construction works.

Course objectives:

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

1. Recognize various construction materials that are essential in construction;
2. Select the quality materials for the use in construction;
3. Test materials for quality, strength and durability and
4. Use available materials in their proper position and state.

Course Contents:

Theory

Unit 1 Stones:

[10 Hours]

- 1.1 Introduction to stones as building units
- 1.2 Stones as various forms of engineering materials
- 1.3 Formation of rocks and its classification
- 1.4 Geological classification of stones
- 1.5 Availability of stones in Nepal
- 1.6 Physical and Chemical properties of stones
- 1.7 Quarrying of stones – Excavation, wedging and blasting,
- 1.8 Blasting of stones – Precautions
- 1.9 Preparing building units from stones- Dressing, Sawing, Polishing, and seasoning.
- 1.10 Method of laying stones as building units-natural bed of stones and construction technique with various stones
- 1.11 Testing of stones for-
 - 1.11.1 Weathering
 - 1.11.2 Durability,
 - 1.11.3 water absorption and porosity,
 - 1.11.4 specific gravity,
 - 1.11.5 Compressive strength
- 1.12 Characteristics of good building stones.

Unit:2 Bricks: [10 Hours]

- 2.1 Introduction
- 2.2 Classification
- 2.3 Brick earth: Composition of brick earth, functions of various constituent of brick earth, harmful constituents.
- 2.4 Preparation of brick earth for making bricks: digging, weathering, blending and temping.
- 2.5 Moulding of bricks and various methods of moulding
- 2.6 Drying of moulded bricks,
- 2.7 Burning of bricks: Intermittent and continuous kilns
- 2.8 Quality of good bricks
- 2.9 Tests of bricks: Compressive strength, Water absorption and Efflorescence.

Unit:3 Clay and Clay Products: [6 Hours]

- 3.1 Various clay products: Roofing Tiles, wall tiles, clay pipes etc
- 3.2 Tiles: different types and uses in construction
- 3.2 Types of tiles: Roofing and Paving tiles.
- 3.4 Manufacturing of tiles
- 3.5 Properties of tiles
- 3.6 Characteristics of machine made tiles

Unit:4 Lime: [8 Hours]

- 4.1 Introduction
- 4.2 Properties of limes
- 4.3 Classification of limes: Fat Lime (white lime), Lean lime, and Hydrated lime.
- 4.4 Setting action of lime
- 4.5 Manufacturing of lime
- 4.6 Raw materials, burning, slaking and setting.
- 4.7 local and other methods of manufacture
- 4.8 Testing of Limes: Visual examination test, acid test, ball test, impurity test and working test

Unit: 5 Cement: [10 Hours]

- 5.1 Introduction
- 5.2 Uses of Cement in Construction
- 5.3 Raw materials (Ingredients) of Cement
- 5.4 Manufacturing process
- 5.5 Wet process of manufacturing
- 5.6 Flow diagram of wet process manufacturing
- 5.7 Various types of cement and their properties
- 5.8 Storage and transportation
- 5.9 Various admixtures
- 5.10 Standards test on Cement

Unit: 6 Timber and Timber products:

[10 Hours]

- 6.1 Introduction
- 6.2 Definition and sources of timber
- 6.3 Classification of trees
- 6.4 Growth of trees
- 6.5 Structure of tree, hard wood and soft wood and their characteristics,
- 6.6 Defects in timber, Felling of timber, Conversion of Timber,
- 6.7 Various method of Sawing,
- 6.8 Seasoning of Timber, Objectives of Seasoning, Various methods of seasoning, Prevention of drying of logs, Preservation of Timbers,
- 6.9 Plywood, Lamina Boards, Block boards, Hard boards, Fiber boards

Unit: 7 Metals and Alloys:

[10 Hours]

- 7.1 Ferrous and Non-ferrous metals
- 7.2 Uses of different metals in construction
- 7.3 Occurrence of Iron: Pig iron
- 7.4 Properties and uses of:
 - Cast iron
 - Wrought iron
- 7.5 Comparison with wrought iron with cast iron in similar headings
- 7.6 Steel: Composition, properties and uses, different types of steels
- 7.7 Corrosion in ferrous metals
- 7.8 Protection of ferrous metals
- 7.9 Alloys: composition, properties and uses.

Unit: 8 Paints and Varnishes:

[6 Hours]

- 8.1 Introduction – Paints and Varnishes
- 8.2 Uses of Paints and Varnishes
- 8.3 Types of Paints
- 8.4 Composition of various types of Paints: Oil paint, Water Paint, Cement paints and Acrylic paints
- 8.5 Preparation techniques of various paints
- 8.6 Methods of application on various construction locations

Unit: 9 Miscellaneous Materials:

[5 Hours]

- 9.1 Asbestos (source, properties, types and hazards)
- 9.2 Glass (Constituents, types, properties, applications and limitation in use)
- 9.3 Plaster of Paris
- 9.4 Insulation Boards
- 9.5 Terrazzo tiles
- 9.6 Vinyl tiles

Practical (Laboratory)

(15 Hours)

1. Test fineness of cement
2. Test consistency of cement
3. Determine initial and Final setting time of cement
4. Perform compressive test of cement
5. Perform tensile test of cement

References:

1. Chong, C.V.Y., (1977). Properties of Materials, MacDonal and Evans Ltd. Estover, Plymouth, UK
2. Gupta, R. B. , (1974). Material Science and Processes, Satya Prakashan, Inc. Tech India Publication, New Delhi.

Engineering Drawing II

EG 1201 AR

Year: I
Semester: II

Total: 4 hours /week
Lecture: hours/week
Tutorial: hours/week
Practical: 4 hours/week
Lab: hours/week

Course description:

This course is designed to impart knowledge and skills on drawing pictorial view (in isometric and oblique) of the solid, surface development and intersection between two elements.

Instructors are requested to manage and deliver the related theoretical contents at drawing room just before conducting the specific practical work. All the theoretical and practical classes should be conducted with in total time of 60 Hours as allotted.

Course objectives:

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

1. Analyze/ draw the different orthographic projections;
2. Analyze/draw the different pictorial projections;
3. Draw surface development and
4. Analyze/ draw intersection.

Course Contents:

Theory

Unit 1. Axonometric Projection:	[0.5 Hour]
1.1. Types of axonometric projection,	
1.2. Introduction of axonometric projection	
1.3. Isometric and oblique projection.	
Unit 2. Oblique Drawing:	[0.5 Hour]
2.1. Oblique drawing	
2.2. Measurement in receding axis	
2.3. Rules for placing object in oblique (box method)	
2.4. Cavalier and Cabinet projection	
2.5. Making of Angle, Circular arc in oblique drawing	
Unit 3. Isometric Drawing:	[0.5 Hour]
3.1 Isometric scale	
3.2 Angle of receding axis	
3.3 Isometric drawing and isometric projection	
3.4 Isometric and Non isometric line	
3.5 Making of angle, circular arc in isometric view	

- Unit 4. Projection of True length and shape of oblique line and shape:** [0.5 Hour]
- 4.1. Introduction of oblique line
 - 4.2. True length and angle to HP/VP of oblique line
 - 4.3. True shape of oblique plane
 - 4.4. Revolving method
 - 4.5. Replacing Method
- Unit 5. Projection of intersection of line and plane:** [1 Hour]
- 5.1. Method of finding of intersection point
 - 5.2. Method of finding the seen and hidden part of line
 - 5.3. Method of finding the angle between plane and line
- Unit 6. Projection of Intersection plane and plane:** [0.5 Hour]
- 6.1. Line of intersection
 - 6.2. Seen and hidden part of plane
 - 6.3. Finding the dihedral angle between two planes
- Unit 7. Projection of points and line on the surface of geometrical solids:** [0.5 Hour]
- 7.1. Finding the points and lines by generating method
 - 7.2. Finding the points and line by cutting plane method
- Unit 8. Projection of intersection between line and geometrical solids:**
- 8.1. Projection of piercing point by generating method
 - 8.2. Projection of piercing point by cutting plane method
- Unit 9. Section :** [1 Hour]
- 9.1. Introduction of section and its needed
 - 9.2. Sectional plane and sectional views
 - 9.3. Projection of sectional views
 - 9.4. Type of section- Longitudinal and cross section- Full section, half section, offset section, detail section etc.
- Unit 10. Projection of intersection between planes and simple geometrical solids and its Surface development with true shape of cut portion:** [0.5 Hour]
- 10.1. Introduction sectional plane and solid
 - 10.2. Understanding the development of surfaces
 - 10.3. Method of development
 - 10.4. Method for development of cut surfaces
- Unit 11. Projection of intersection between surfaces of solids:** [1.5 Hour]
- 11.1. Introduction about surfaces of solids
 - 11.2. Type of cutting plane (Vertical/Horizontal projecting plane)
 - 11.3. Determination of line/curve of intersection
 - 11.4. After the intersection of two solids that shape will be occurring of touched at touched portion

Practical (Class work sheet)

Sheet No. 1

[10 Hours]

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

Sheet No 2

[10 Hours]

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

Sheet No 3

[3 Hour]

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

Sheet No 4

[3 Hours]

1. Perform projection drawing of intersection of line a triangular plane showing the point of intersection,
2. Draw true shape of plane and angle between plane and line on the edge of given plane (At least two exercises should be done).

Sheet No 5

[3 Hours]

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

Sheet No 6

[1 Hour]

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

Sheet No 7.

[3 Hours]

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

Sheet No 8

[2 Hours]

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

Sheet No 9.**[10 Hours]**

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

Sheet No 10**[8 Hours]**

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

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

References:

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

Computer Application

EG 1211 CT

Year: I
Semester: II

Total: 4 hours/week
Lecture: 2 hours/week
Tutorial: hours/week
Practical: 2 hours/week
Lab: hours/week

Course description:

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

Course objectives:

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

1. Understand the basic architecture of Computer;
2. Identify major components of computer and their role;
3. Know the different Operating Systems like MS-DOS, Windows etc;
4. Use the different Software applications and
5. Understand the basic networking and internet concept.

Course Contents:

Theory

Unit 1	Introduction to Computers:	[2 Hours]
	1.1 History of computers	
	1.2 Generation and type of computers	
	1.3 Computer hardware and software	
Unit 2	Hardware Components:	[6 Hours]
	2.1 Major blocks of a digital computer	
	2.2 Input devices like keyboard, mouse, joystick, scanner, light pen etc.	
	2.3 Output devices like monitor, printer, plotter, sound card, speaker etc.	
	2.4 Central Processing Unit	
	2.5 Memory Unit: RAM, ROM, PROM, EPROM	
	2.6 Auxiliary storage devices:	
	• Magnetic storage like floppy disk, hard disk, magnetic tape etc.	
	• Optical storage like CD-ROM, DVD	
	• Pen drive, flash memory card etc.	
Unit 3	Introduction to Operating System Software:	[6 Hours]
	3.1 Importance and use of operating systems (OS)	
	3.2 Type of OS: MS-DOS, Windows, Unix, Linux	
	3.3 File management, device management and memory management by OS	

- 3.4 MS-DOS system files: io.sys, msdos.sys, command.com, config.sys, autoexec.bat
- 3.5 MS-DOS internal and external commands
- 3.6 Windows Operating System: Graphical User Interface and windows environment, file/folder management
- 3.7 Linux: GNU open source operating system

Unit 4 Application Packages: [7 Hours]

- 4.1 Text Editors (edit in DOS, notepad in Windows, vi editor in Linux)
- 4.2 Word Processing Package: Microsoft Word
- 4.3 Spreadsheet Package: Microsoft Excel
 - Entering data
 - Using formula
 - Basic calculations
 - Financial calculations
 - Charts
- 4.4 Concept of Database management system
- 4.5 Database management package: Microsoft Access
- 4.6 Presentation Package: Microsoft PowerPoint

Unit 5 Utility Programs: [2 Hours]

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

Unit 6 Networks and Internet: [7 Hours]

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

Practical

[30 Hours]

1. Identification of major components of computer and familiarization with keyboard and mouse. (1 session)
2. Internal and External DOS commands (1 session)
3. Windows Graphical User Interface and file/folder management (1 session)
4. Microsoft Word (2 sessions)
 - a. Editing text
 - b. Formatting document
 - c. Creating tables
 - d. Creating graphics and word art
5. Microsoft Excel (3 sessions)
 - a. Editing worksheet
 - b. Data formatting and manipulation
 - c. Analysis of data(use of functions for calculation)
 - d. Charts/Data presentation
 - e. Import/Export data
6. Microsoft Access (2 sessions)
 - a. Creating and manipulating data tables
 - b. Query
 - c. Forms/Reports
7. Using Multimedia and Internet/Email (1 session)
8. Creating effective presentation using Microsoft PowerPoint (1 session)
9. Project Work (3 sessions)

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

Textbooks:

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

References:

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

Second Year

(Third and Fourth Semesters)

Third Semester

Subjects:

- | | | |
|---|------------|-----------------------------|
| 1 | EG 2104 SH | Engineering Mathematics III |
| 2 | EG 2101CE | Surveying I |
| 3 | EG 2102 CE | Applied Mechanics |
| 4 | EG 2103 CE | Basic Hydraulics |
| 5 | EG 2104 CE | Building Construction |
| 6 | EG 2105 CE | Construction Drawing |
| 7 | EG 2106 CE | Computer Aided Drafting |

Engineering Mathematics III

EG 2104 SH

Year: II
Semester: I

Total: 4 hours /week
Lecture: 3 hours/week
Tutorial: 1 hour/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 Hours]

- 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 Hours]

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 Hours]

- 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 Hours]

- 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 Hours]

- 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.

Surveying I

EG 2101CE

Year: II
Semester: I

Total: 8 hours /week
Lecture 3 hours/week
Tutorial: hours/week
Practical: 5 hours/week
Lab: hours/week

Course description:

This course focuses on familiarization on different surveying techniques and handling of surveying equipment. The different surveying techniques include linear, angular, vertical measurements, and plotting skills.

Course objectives:

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

1. Apply distance measurement techniques and
2. Use basic surveying techniques and plotting of plan and map.

Course Contents:

Theory

- Unit 1 Introduction:** [4 Hours]
- 1.1 History and definition of surveying
 - 1.2 Primary division of survey
 - 1.3 Classifications according to discipline, nature and instruments used
 - 1.4 Principles of surveying
 - 1.5 Units of measurements
 - 1.6 Scales and their types
 - 1.7 Maps and conventional symbols
- Unit 2 Accuracy and Errors:** [2 Hours]
- 2.1 Definition of accuracy, precision and error
 - 2.2 Types and sources of errors
- Unit 3 Linear Distance Measurement:** [8 Hours]
- 3.1 Horizontal distance
 - 3.2 Different methods of distance measurement i.e. direct, indirect and GPS technology
 - 3.3 Equipments for direct chaining
 - 3.4 Ranging and its methods
 - 3.5 Chaining on horizontal and sloping ground by direct and indirect methods
 - 3.6 Errors in chaining and precision ratio
 - 3.7 Tape correction for various parameters
 - 3.8 Field procedures and problems

Unit 4 Chain Surveying: [6 Hours]

- 4.1 Principles of chain surveying
- 4.2 Survey stations and Survey lines
- 4.3 Procedures of chain surveying
 - 4.3.1 Recci
 - 4.3.2 Selection of survey stations and survey lines
 - 4.3.3 Referencing and marking of stations
 - 4.3.4 Detailing
- 4.4 Obstacles in chaining
- 4.5 Plotting and field problems

Unit 5 Compass Traversing: [12 Hours]

- 5.1 Introduction
- 5.2 Technical terms meridians, bearings angles etc
- 5.3 System of bearings, fore and back bearing
- 5.4 Prismatic and Surveyor's compass
- 5.5 Calculation of angles from bearing and bearing from angles, angular precision
- 5.6 Magnetic declination, local attraction, detection and correction of local attraction
- 5.7 Plotting and graphical adjustment of traverse and relative precision
- 5.8 Errors in compass
- 5.9 Field problems and procedures

Unit 6 Leveling: [13 Hours]

- 6.1 Definition and objectives
- 6.2 Classification of leveling according to principles
- 6.3 Technical terms used in leveling
- 6.4 Instruments used in leveling
- 6.5 Temporary adjustment of level
- 6.6 Two peg test
- 6.7 Methods for booking and reducing of level
- 6.8 Classification of direct leveling
 - 6.8.1 Simple leveling
 - 6.8.2 Continuous or differential leveling
 - 6.8.3 Fly leveling
 - 6.8.4 Check leveling
 - 6.8.5 Reciprocal leveling
 - 6.8.6 Profile leveling and cross sectioning
 - 6.8.7 Precise leveling
- 6.9 Errors in leveling
- 6.10 Error adjustment in closed circuit
- 6.11 Field procedures, problems and plotting of graphs

Practical (Field work)

- | | |
|---|-------------|
| 1. Care and handle instruments. | [5.0 Hours] |
| 2. Measure linear distance on plane and sloping ground. | [10 Hours] |
| 3. Perform Chain triangulation and detailing. | [20 Hours] |
| 4. Perform Compass traversing and detailing. | [20 Hours] |
| 5. Perform Leveling | [20 Hours] |
| 5.1 Two peg test | |
| 5.2 Fly leveling | |
| 5.3 Profile leveling and cross sectioning | |

Evaluation of Practical: Continuous evaluation (Viva + Instrumentation + Objective test)

Textbooks:

1. Dr. BC Punmia, " Surveying " Vol I and II, Laxmi Publication New Delhi

References:

1. R. Agor, " Surveying and Leveling", Khanna Publication New Delhi
2. SK Duggal, " Surveying" Vol I and II, Tata MC Graw Hill Publishing
3. N Basnet and M Basnet, " Basic Surveying – I", Benchmark Education Support Pvt. Ltd., Tinkune Kathmandu
4. N Basnet and M Basnet, "Basic Surveying –II", Published by D. Shrestha & R. Shrestha , Rajmati Press, Lalitpur

Applied Mechanics

EG 2102 CE

Year: II
Semester: I

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2/2 hours/week

Course description:

This course focuses on analysis and effect of various types of forces on the particle and body at rest.

Course objectives:

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

1. Understand the concept of particle and rigid body and application of equations of static equilibrium;
2. Describe the different types of forces that may act on the body and analysis of typical problems;
3. Be familiar with the frictional force on the body and analysis of typical problems;
4. Be familiar with the distributed forces (Centre of gravity, Centroid, and Moment of Inertia) and calculation and
5. Know about the structure (beam and truss), their supports, loads and analysis of them.

Course Contents:

Theory

Unit 1	Introduction:	[4 Hours]
	1.1 Definition and scope of Applied Mechanics	
	1.2 Concept of Particle, Rigid Body, Deformed Body, Free Body Diagram and Equilibrium of particle and Rigid Body	
	1.3 Equations of Static Equilibrium: Two and Three Dimensional analysis of Particle, Two Dimensional analysis of Rigid Body	
Unit 2	Forces acting on Particle and Rigid Body:	[9 Hours]
	2.1 Different types Forces: Internal, External, Translational, Rotational, Coplanar, Non-Coplanar, Concurrent, Non-Concurrent, Like Parallel and Unlike Parallel	
	2.2 Resolution and Composition of Forces	
	2.3 Principle of Transmissibility and Equivalent Forces	
	2.4 Moments and Couples	
	2.5 Varignon's Theorem	
	2.6 Resolution of a Force in to a Force and a Couple	
	2.7 State and Prove: Triangle Law of Forces, Parallelogram law of Forces Polygon Law of Forces and Lami's Theorem	

Unit 3	Friction:	[5 Hours]
	3.1 Friction: Definition, Causes, Advantages, Disadvantages and Types	
	3.2 Laws of Dry Friction	
	3.3 Static and Dynamic Friction and Their Coefficients	
	3.4 Angle of Friction	
	3.5 Different status (No Friction, Certain Friction, Impending Motion and Motion)	
	3.6 Sliding and Tipping Condition of the Body	
Unit 4	Centre of Gravity and Centroid:	[6 Hours]
	4.1 Concept of Centre of Gravity, Centroid, Axis of Symmetry	
	4.2 Centroid of Composite lines (straight line, arc, semicircle and quarter circle)	
	4.3 Centroid of Composite Area (Rectangle, Triangle, Circle / Semi-circle / Quarter circle / Circular sector, Parabola / Semi-parabola and Ellipse)	
	4.4 Centroid of Area under curve by the method of Integration	
Unit 5	Moment of Inertia:	[6 Hours]
	5.1 First Moment and Second Moment of Area	
	5.2 Axial and Polar Moment of Inertia	
	5.3 Moment of Inertia of Regular Areas (Rectangle, Triangle, Circle and Ellipse) about their Centroidal axes	
	5.4 Perpendicular and Parallel axis Theorem for Moment of Inertia	
	5.5 Moment of Inertia of Composite Area	
	5.6 Radius of Gyration	
Unit 6	Structures:	[5 Hours]
	6.1 Structure and Mechanism	
	6.2 Plane and Space Structures	
	6.3 Different types of Load and Support in the Structures	
	6.4 External and Internal forces (Axial Force, Shear Force, and Bending Moment) in the Structural Members	
	6.5 Relationship between Load, Shear Force and Bending Moment	
	6.6 Determinacy and Stability (Statically and Geometrically) of the Structures	
Unit 7	Analysis of Statically Determinate Beam:	[5 Hours]
	7.1 Definition and Types of Beam	
	7.2 Calculation of Support Reactions and Internal Forces (i.e. Axial Force, Shear Force and Bending Moment) of the Beam	
	7.3 Draw Axial Force, Shear Force and Bending Moment Diagrams of the Beam	
Unit 8	Analysis of Statically Determinate Plane Truss:	[5 Hours]
	8.1 Definition, uses and Types of Truss	
	8.2 Calculation of Member Force by the Method of Joints	
	8.3 Calculation of Member Force by the Method of Sections	

Practical (Laboratory)

[15 Hours]

1. Verify Triangle law of forces, Parallelogram law of forces and Lami's theorem
2. Verify Principle of Moments
3. Determine Centroid of Plane Figures (Rectangle, Triangles, Circle and Ellipse)
4. Determine Moment of Inertia by Flywheel
5. Determine Support Reactions of Simply Supported and Cantilever Beam with different types of Loading
6. Determine Support Reactions and Member Force of Simply supported Truss

Textbooks:

1. F. P. Beer & E. R. Johnston Jr, "*Vector Mechanics for Engineers - Statics*", McGraw-Hill
2. I. H. Shames, "*Engineering Mechanics - Statics and Dynamics*", New Delhi, Prentice Hall of India
3. R. C. Hibbeler, "*Engineering Mechanics*", McMilan Publishing Company, New York

References:

1. M. R. Dhital, "*A Course Manual on Applied Mechanics I (Statics)*", IOE, Pulchowk Campus
2. R. Suwal, "*A Text Book of Applied Mechanics*", R & R Engineering Consultancy Pvt. Ltd
3. R. S. Khurmi, "*Applied Mechanics and Strength of Materials*", Nirja Construction and Development Pvt. Ltd., Ram Nagar, New Delhi

Basic Hydraulics

EG 2103 CE

Year: II
Semester: I

Total: 5 hours /week
Lecture: 3 hours/week
Tutorial: 1 hour/week
Practical: hours/week
Lab: 2/2 hours/week

Course description:

This course focuses on the fundamental concepts and principles of Hydraulics, measurement of flow, introduction to open channel flow and pipe flow.

Course objectives:

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

1. Understand the properties of fluid;
2. Analyze the behaviour of fluid at rest;
3. Analyze the behaviour of fluid in motion;
4. Apply the measurement techniques for pressure and discharge;
5. Understand the concept of head loss in pipe flow and
6. Understand the basic concept of open channel flow.

Course Contents:

Theory

Unit 1	Introduction:	[5 Hours]
	1.1 Introduction to Fluid	
	1.2 Introduction to Fluid Mechanics and Hydraulics	
	1.3 Properties of fluid (Definition, formula, unit and dimension): mass density, specific weight, specific volume, specific gravity, viscosity (Newton's law, Dynamic and kinematic viscosity), compressibility and Bulk Modulus	
	1.4 Difference between real and ideal fluid	
	1.5 Difference between Newtonian and Non-Newtonian fluid	
Unit 2	Hydrostatics:	[10 Hours]
	2.1 Introduction to fluid pressure	
	2.2 Pascal's law	
	2.3 Derivation for pressure-depth relationship (Hydrostatic law)	
	2.4 Definition of atmospheric pressure, gauge pressure and absolute pressure	
	2.5 Measurement of pressure by piezometer and U-tube manometer	
	2.6 Definition of total pressure and center of pressure	
	2.7 Derivation for total pressure and center of pressure on vertical and inclined plane submerged surface	
	2.8 Definition of Buoyancy and Archimedes' principle	

2.9 Principle of floatation

- Unit 3 Hydrokinematics: [5 Hours]**
- 3.1 Types of flow: Steady and unsteady, uniform and non-uniform, laminar and turbulent, compressible and incompressible, rotational and irrotational, one, two and three dimensional
 - 3.2 Reynold's number: Definition, equation and criteria for laminar and turbulent flow
 - 3.3 Streamline: Definition, equation, characteristics
 - 3.4 Conservation principles and continuity equation for one dimensional incompressible flow
- Unit 4 Hydrodynamics: [3 Hours]**
- 4.1 Energy of flowing fluid: potential or datum energy, kinetic energy, pressure energy
 - 4.2 Concept of energy head
 - 4.3 Bernoulli's theorem: Statements, assumptions, equation and applicability
 - 4.4 Concept of Hydraulic gradient line (HGL) and energy gradient line (EGL)
- Unit 5 Pipe Flow: [5 Hours]**
- 5.1 Introduction to pipe flow
 - 5.2 Velocity profile for laminar and turbulent flow through pipes
 - 5.3 Loss of head in pipes: introduction to major and minor loss
 - 5.4 Derivation of Darcy-Weisbach equation for loss of head due to friction
 - 5.5 Derivation of equation for expansion and contraction loss
- Unit 6 Open Channel Flow: [7 Hours]**
- 6.1 Difference between pipe flow and open channel flow
 - 6.2 Types of open channel flow: steady and unsteady, uniform and non-uniform (gradually varied, rapidly varied and spatially varied flow), laminar and turbulent, subcritical, critical and supercritical flow
 - 6.3 Geometric elements of open channel (flow depth, flow area, top width, wetted perimeter, hydraulic radius, hydraulic depth, section factor)
 - 6.4 Velocity distribution in open channel flow
 - 6.5 Chezy's equation and Manning's equation for the computation of velocity in uniform flow
 - 6.6 Energy equation and momentum equation in open channel flow
 - 6.7 Specific energy: Definition, equation and diagram
- Unit 7 Flow Measurement: [10 Hours]**
- 7.1 Orifice: Definition and types, definition of vena-contracta
 - 7.2 Derivation of equation for discharge through small orifice
 - 7.3 Hydraulic coefficients of orifice: coefficient of discharge, velocity and contraction (definition, formula and experimental method of determination)

- 7.4 Concept of venturimeter, derivation of equation for discharge through venturimeter
- 7.5 Introduction to weir or notch and their classifications
- 7.6 Derivation of equation for discharge through rectangular, triangular and trapezoidal weir or notch
- 7.7 Area-velocity method for the discharge measurement in open channel (float and current meter): description of measurement technique, mid-section method for discharge computation

Tutorials:

[15 Hours]

1. Numericals of fluid properties
2. Pressure computation, Pressure measurement by piezometer and U-tube manometer, Total pressure and center of pressure for vertical and inclined submerged surface, principle of floatation
3. Computation of discharge by using continuity equation, computation of Reynold's number and identifying type of flow
4. Application of Bernoulli's equation with and without head loss
5. Head loss computation in pipe flow
6. Cross-sectional properties, velocity, discharge and flow depth computation for uniform flow through open channel
7. Computation of discharge through orifice, venturimeter, rectangular, triangular and trapezoidal weir, mid-section method for discharge computation

Practical (Laboratory)

[15 Hours]

1. Measure pressure by piezometer and manometer
2. Verify Bernoulli's theorem using venturimeter
3. Measure flow through orifice
4. Measure river discharge by float method

Textbooks:

1. R.K. Bansal, "*Fluid Mechanics and Hydraulic Machines*", Laxmi Publications (P) Ltd.

References:

1. R.K. Rajput, "*Fluid Mechanics and Hydraulic Machines*", S. Chand & Company Ltd.
2. A.K. Upadhyay, "*Hydraulics and Pneumatics*", S.K. Kataria and Sons.

Building Construction

EG 2104 CE

Year: II
Semester: I

Total: 8 hours /week
Lecture: 5 hours/week
Tutorial: 1 hour/week
Practical: 1 hour/week
Lab: 2/2 hour/week

Course description:

This course is designed to provide knowledge and skills in building construction techniques and technology including earthquake resisting construction technology. It intends to provide skills and knowledge on preparing drawings and sketches of building components.

Course objectives:

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

1. Identify the different components of buildings;
2. Follow the steps of construction systematically;
3. Supervise and test on the workmanship and quality of materials to be used in construction and
4. Acquire knowledge and skills on earthquake resistant building construction techniques.

Course Contents:

Theory

Unit 1: Introduction to Building Construction:

[4 Hours]

- 1.1 Definition of building and its uses
- 1.2 Building types
- 1.3 General components of a building
- 1.4 Technical terms used in buildings
- 1.5 General requirements of parts of building
- 1.6 General rules of Vaastu

Unit 2: Foundation and its types:

[10 Hours]

- 2.1 Foundation and its purposes
- 2.2 Site exploration and its purposes
- 2.3 Preliminary soil investigation
- 2.4 Methods of site investigation
- 2.5 Depth and spacing of trial pits or bore holes
- 2.6 Bearing capacity of soil and methods of determination
- 2.7 Plate load test method
- 2.8 Penetration test method in brief
- 2.9 Safe bearing capacity values based on N.S, and I.S. code.
- 2.10 Methods of improving bearing capacity of soil

- 2.11 Types of shallow foundation and their uses
- 2.12 Causes of failure of foundation and remedy
- 2.13 Setting out of foundation
- 2.14 Timbering of trenches
- 2.15 Construction of foundation under water lodged trenches.
- 2.16 Deep foundation and its types (introduction only)
- 2.17 Design example on masonry wall foundation
- 2.18 Design example on brick pillar foundation

Unit 3: Masonry Wall:

[6 Hours]

- 3.1 General introduction to
 - 3.1.1 Types of bricks
 - 3.1.2 Types of bonds
 - 3.1.3 Types of junctions
- 3.2 bonds in Piers
- 3.3 Piers attached to main walls
- 3.4 Retaining wall
- 3.5 Stability of retaining walls
- 3.6 Thumb rules of retaining wall construction
- 3.7 Strength of brick masonry
- 3.8 Permissible compressive stress in brick masonry
- 3.9 Defects in brick masonry
- 3.10 Reinforced brickwork

Unit 4: Stone Masonry :

[6 Hours]

- 10.1. General definition
- 10.2. Technical Terms used in masonry
- 10.3. Dressing and selection of surface finish
- 10.4. Setting of stone work
- 10.5. Joints in stone masonry
- 10.6. General principles to be observed in stone masonry construction
- 10.7. Classification of stone masonry
- 10.8. Selection of stone for masonry
- 10.9. Stone masonry block construction
- 10.10. Safe permissible loads on stone masonry.
- 10.11. Composite masonry in stone and brick
- 10.12. Cement concrete block masonry

Unit 5: Partition and Cavity wall:

[4 Hours]

- 5.1. Objectives of partition wall
- 5.2. Types of partition walls

- 5.3. Advantage of cavity wall
- 5.4. Position of cavity
- 5.5. Wall ties and construction details
- 5.6. Precautions on cavity construction

Unit 6: Damp and Water Proofing:

[4 Hours]

- 6.1. Dampness and its effects on construction works
- 6.2. Causes and sources of dampness
- 6.3. Methods of damp proofing
- 6.4. Materials used for damp proofing
- 6.5. Damp proofing treatment in
 - 6.5.1. Foundation
 - 6.5.2. Walls
 - 6.5.3. Floors
 - 6.5.4. Roofs
 - 6.5.5. Parapet walls

Unit 7: Concrete and Concrete Construction:

[10 Hours]

- 7.1. Concrete and grades of concrete
- 7.2. Properties of concrete
- 7.3. Methods of proportioning concrete mixes
- 7.4. Mix design
 - 7.4.1. Design mix
 - 7.4.2. Nominal mix
- 7.5. Concreting processes
 - 7.5.1. Batching of materials
 - 7.5.2. Concrete mixing
 - 7.5.3. Transportation of concrete
 - 7.5.4. Placing of concrete
 - 7.5.5. Compaction of concrete
 - 7.5.6. Curing of concrete
- 7.6. Concreting under water
- 7.7. Placing under cold weather
- 7.8. Placing concrete in hot weather
- 7.9. Water proofing of concrete
- 7.10. Steel reinforcement
- 7.11. Permissible stresses in reinforcement
- 7.12. Reinforced cement concrete and its characteristics
- 7.13. Advantages of reinforced cement concrete
- 7.14. Concreting equipments and accessories
- 7.15. Causes of failure of reinforced concrete structure

Unit 8: Formworks and Scaffolding:

[5 Hours]

- 8.1. Characteristics of good formwork
- 8.2. Materials for formwork
 - 8.2.1. Timber formwork
 - 8.2.2. Plywood formwork
 - 8.2.3. Steel formwork
- 8.3. Construction of formwork
- 8.4. Order and method of removing formwork
- 8.5. Types of shoring and their uses
- 8.6. Types of scaffolding and their uses.

Unit 9: Lintels and Arches:

[4 Hours]

- 9.1. Lintels and its uses
- 9.2. Types of lintels in terms of material used
- 9.3. Arch and its uses
- 9.4. Types of arches and materials of construction

Unit 10: Floors and Floor finishes:

[10 Hours]

- 10.1. Ground floor and its types
 - 10.1.1 Mud floor
 - 10.1.2 Brick floor
 - 10.1.3 Timber floor
 - 10.1.4 Flagstone floor
 - 10.1.5 Tile floor
 - 10.1.6 Marble floor
 - 10.1.7 Concrete floor
- 10.2. Upper floor and its types
 - 11.5.4 Timber floor
 - 11.5.5 Reinforced cement concrete floor
 - 11.5.6 Reinforced brickwork floor
 - 11.5.7 Precast concrete floor
- 10.3. Floor finishes and construction methods
 - 10.3.1 Plaster punning
 - 10.3.2 Mosaic tile
 - 10.3.3 Porcelain ceramic tile
 - 10.3.4 Marble
 - 10.3.5 Parqueting

Unit 11: Stairs and Roofs:

[8 Hours]

- 11.1. Location of stair types of stair
- 11.2. Technical terms used

- 11.3. Requirements of good stair
- 11.4. Fixing of going and rise
- 11.5. Types of roofs
 - 11.5.1 Slope or pitched roof
 - 11.5.1.1 Lean to roof
 - 11.5.1.2 Coupled roof
 - 11.5.1.3 Scissors roof
 - 11.5.1.4 King and Queen post roof truss
 - 11.5.2 Flat roof
 - 11.5.1.2 Mud terraced roof
 - 11.5.1.3 Brick, glazed tiled roof
- 11.6. Roof covering
 - 11.6.1 Thatch covering
 - 11.6.2 Shingle
 - 11.6.3 Tile
 - 11.6.4 A.C. and C.G.I. sheet
 - 11.6.5 Slate
 - 11.6.6 Laying and fixing of roof coverings

Unit 12: Doors and Windows:

[10 Hours]

- 12.1. Location of doors and door sizes
- 12.2. Door frame
- 12.3. Types of doors
 - 12.3.1 Battened, ledged braced and framed door
 - 12.3.2 Framed and Paneled door
 - 12.3.3 Flush door
 - 12.3.4 Sliding door
 - 12.3.5 Revolving door
 - 12.3.6 Collapsible steel door
 - 12.3.7 Rolling steel shutter door
- 12.4. Types of windows
 - 12.4.1 Fixed window
 - 12.4.2 Sliding window
 - 12.4.3 Double hung window
 - 12.4.4 Casement window
 - 12.4.5 Sash or glazed window
 - 12.4.6 Corner window
 - 12.4.7 Bay window
 - 12.4.8 Ventilators
- 12.5. Erecting and fixing of door and window frames
- 12.6. Fixtures and fastenings of door and windows

Unit 13: Finishing Works:

[5 Hours]

- 13.1. Plasterworks
 - 13.1.1 Material used (mud, lime, cement ,surkhi)
 - 13.1.2 Plaster applying procedures
 - 13.1.3 Pointing works on brick and stone masonry
- 13.2. Paints and painting procedure
 - 13.2.1 Cement paint
 - 13.2.2 Enamel paint
 - 13.2.3 Distemper
 - 13.2.4 Emulsion paint
- 13.3. Heritage plaster

Unit 14: Miscellaneous Construction Works:

[5 Hours]

- 14.1. Purpose and materials used for false ceiling
- 14.2. Plaster of Paris works
- 14.3. Causes and prevention of cracks in buildings
- 14.4. Methods to prevent termite action

Unit 15: Earthquake:

[14 Hours]

- 15.1** Concept of earthquake (2 Hours)
 - 15.1.1 Introduction
 - 15.1.2 Terminologies
 - 15.1.3 Causes of earthquake
 - 15.1.4 Earthquake locations
 - 15.1.5 Measurement of Earthquake
 - 15.1.5.1 Earthquake Magnitude
 - 15.1.5.2 Earthquake Intensity
 - 15.1.6 Seismicity of Nepal
 - 15.1.7 Seismic hazard of Nepal
- 15.2** Earthquake effect (1Hour)
 - 15.2.1. Ground effects
 - 15.2.2 Effects of earthquake on buildings
 - 15.2.3. Causes of failure
- 15.3** Building forms for earthquake resistance (2 Hours)
 - 15.3.1. Building configuration
 - 15.3.2. Height and number of storey
 - 15.3.3 Distribution of load bearing elements
 - 15.3.4. Location and size of door and window openings
- 15.4** Masonry building with rectangular building units in cement mortar (3 Hours)
 - 15.4.1. Improving buildings for seismic safety
 - 15.4.2. Foundation
 - 15.4.2.1.RC Strip
 - 15.4.2.2. PCC Strip / lime Strip
 - 15.4.2.3. Plum concrete
 - 15.4.2.4. Brick / stone masonry

- 15.4.3. Walls
 - 15.4.3.1. Openings
 - 15.4.3.2. Reinforcement of opening
 - 15.4.3.3. Wall Reinforcement
 - 15.4.3.3.1. Strengthening the junctions
 - 15.4.3.3.2. Bands
 - 15.4.3.3.3. Vertical Reinforcement
- 15.5. Concrete block walls
- 15.6. Separation and crumple sections
- 15.7. Low strength Masonry in rectangular block and stone (3 Hours)
 - 15.7.1. Definition
 - 15.7.2. Limitations
 - 15.7.3. Strengthening measures
 - 15.7.4. Materials
 - 15.7.5. Walls
 - 15.7.5.1. Thickness
 - 15.7.5.2. Buttresses
 - 15.7.5.3. Door and window openings
 - 15.7.5.3.1. Rectangular block masonry
 - 15.7.5.3.2. Stone masonry
 - 15.7.5.4. Construction
 - 15.7.5.4.1. Block masonry
 - 15.7.5.4.2. Stone masonry
 - 15.7.5.5. Stitches
 - 15.7.5.6. Bands
 - 15.7.5.7. Vertical Reinforcing
- 15.8. Detailing of RC Frames (3 Hours)
 - 15.8.1. Foundation
 - 15.8.2. Beam
 - 15.8.2.1. Dimensions
 - 15.8.2.2. Longitudinal Reinforcement
 - 15.8.2.3. Web Reinforcement
 - 15.8.3. Column
 - 15.8.3.1. Dimension
 - 15.8.3.2. Longitudinal Reinforcement
 - 15.8.3.3. Web Reinforcement
 - 15.8.4. Beam Column Joint
 - 15.8.4.1. Transverse Reinforcements

Laboratory/Practical

Unit 1: Laboratory:

[15 Hours]

1. Test bulking of sand
2. Perform slump test
3. Perform compressive strength test of local and machine made bricks
4. Perform compressive strength of concrete/Hollow blocks
5. Observe effects of water cement ratio on concrete

Unit 2: Designs and Drawings Study and Field visit:**[15 Hours]**

Interpret designs/drawings and administer hand on practice on Earthquake resistant construction of following buildings:

1. Stone masonry houses
2. Timber houses
3. Brick and block masonry houses
4. Reinforced Concrete buildings
5. Repair and strengthening existing buildings

Textbooks:

1. Punmia B.C. Dr., *Building Construction* (Latest Edition).
2. Kumar Sushil *Building Construction* (Latest Edition).
3. Sharma S.K. & Kaul B.K., *Building Construction* (Latest Edition).
4. Singh Gurucharan, *Building Planning & Design* (Latest Edition)

References:

1. Department of Urban Development, *Nepal Building Code*
2. Arya A.S., *Masonry and Timber Structure including Earth* (Latest Edition)
3. Jain, *Plain Cement Concrete, Vol I & II* (Latest Edition)
4. Kumar Sushil, *Reinforced Concrete Structure*(Latest Edition)
5. Punmia B.C. Dr., *Reinforced Concrete Structure, Vol. I & II* (Latest Edition)
1. IS 4326-1993; Earthquake Resistant Design and Construction of Buildings-Code of Practice, Bureau of Indian Standards, New Delhi, India
2. NBC 108-1994; Site Consideration, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
3. NBC 109-1994; Masonry: Unreinforced, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
4. NBC 201-1994; Mandatory Rules of Thumb: Reinforced Concrete Buildings with Masonry Infill, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
5. NBC 202-1994; Mandatory Rules of Thumb Reinforced Concrete Buildings without Masonry Infill, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
6. NBC 202-1994; Mandatory Rules of Thumb: Load Bearing Masonry, Government of Nepal, Ministry of Housing and Physical Planning, Department of Buildings, Nepal, 1995.
7. *NSET-Nepal: Earthquakes, A manual for designers and builders,*

Construction Drawing

EG 2105 CE

Year: II
Semester: I

Total: 4 hours /week
Lecture: hour/week
Tutorial: hour/week
Practical: 4 hours/week
Lab: hours/week

Course description:

This course is designed to provide skills in preparing engineering construction drawings. It also intends to impart skills on preparing drawings and sketches of construction details for earthquake resistant building construction and construction other structures.

Course objectives:

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

1. Prepare setting out drawings for construction activities;
2. Draw working drawings of different components of buildings;
3. Prepare working drawing of engineering constructions;
4. Use earthquake resistant building construction techniques and
5. Acquire knowledge and skills on retrofitting techniques for earthquake resistant.

Course Contents:

Unit 1: Drawing and Field Work:

[48 Hours]

- 1 Prepare drawing plate/plates of a building with three or more rooms per floor and two and half or more storied timber sloped roof meeting the requirements of local municipality/ VDC building rules and regulations.
- 2 Prepare setting out plans for earth cutting and construction lines of building drawn in task 1 above.
- 3 Practice staking out in the field of the plan prepared on task 2 above.
- 4 Draw detail drawings of:
 - 4.1. Dog legged stair case (Timber and RCC)
 - 4.2. Door and Window frames including joints and fixing details
 - 4.3. Flush and panel door including joints and fixing details.
 - 4.4. Casement window including joints and fixing details.
- 5 Prepare a roof plan with valleys for CGI, Tile, Thatch and RCC roofing materials including their construction details.
- 6 Draw Racking, Flying and Dead shores with fixing details.
- 7 Draw septic tank and soak pit including sanitary fittings details.
- 8 Prepare working drawing of:
 - 8.1. Canal Gate and Aqueduct
 - 8.2. Slab and pipe Culvert
 - 8.3. Suspended and Suspension Bridge

9 Draw Retrofitting Techniques for Earthquake Resistant

[12 Hours]

9.1 Modification of plan

9.2 Elevation improvement

9.3 Floor and roof improvement (concrete and timber)

9.4 Earthquake resisting wall structure

Textbooks:

1. Civil Engineering Drawing; Gurcharan Singh
2. NSET – NEPAL; Earthquakes, A manual for designers and builders.

References:

1. Sushil Kumar; Building Construction
2. Dr.B.C. Punmia, A.K.Jain, Arun Kr. Jain, Building Construction.
3. W.B. McKay, Building construction, Vols. I – IV, ELBS, LONGMAN

Computer Aided Drafting

EG 2106CE

Year: II
Semester: I

Total: 5 hours /week
Lecture: 2 hours/week
Tutorial: hours/week
Practical: 3 hours/week
Lab: hours/week

Course description:

This course provides students with a broad introduction into 2-dimensional Computer-Aided Drawing and Drafting (CADD) with a focus on *civil engineering drawings*. This course is an intensive introduction to the use of a Computer Aided Design and Drafting (CADD) system for the development of construction drawing and documentation.

Course objectives:

After the completion of this course student will be able to:

1. Learn to use popular CAD software programs (Autodesk Auto CAD) to model construction projects and
2. Create basic Civil and Architectural drawings

Course contents:

Theory

Unit 1: Introduction to the course and Hardware: [2 Hours]

- 1.1. Overview about Fundamental of computer. (Hard ware, software etc.)
- 1.2. Introduction application software (specially CADD, Land Development software)
- 1.3. Overview of a PC, peripherals e.g. printers and plotters, system settings and the Windows environment.

Unit 2: Starting a New Drawing/Opening an Existing Drawing: [2 Hours]

- 2.1. Setting up a drawing, starting from scratch, using a Wizard, using and creating a template file.
- 2.2. Opening an existing drawing
- 2.3. Screen layout, pull-down menus, screen icons, command line and dialogue boxes, status bar toggles,
- 2.4. Setting preferences (Setting Units and Scale, managing drawing area by using MV setup and Limits, setting and use of drafting aids.

Unit 3: Computer Graphics: [2 Hours]

- 3.1. Computer graphics fundamentals (raster object and vector application) data storage and retrieval , hierarchical storage system ,introduction to basic graphical application, drawing exchange .

Unit 4: Drawing Commands: [4 Hours]

- 4.1. Co-ordinate input methods (directive, absolute, relative and polar)
- 4.2. Point, Lines, Polyline, Multiline, Construction Lines
- 4.3. Circle, Arc, Ellipse, Donut
- 4.4. Polygon, Rectangle, Spline, , solids etc
- 4.5. Hatching
- 4.6. Text (multi-line & single line / true type fonts
- 4.7. Dimensions

Unit 5: Modify Commands: [6 Hours]

- 5.1. Object selection
- 5.2. Erase, Trim, Break
- 5.3. Copy, Mirror, Offset, Array,
- 5.4. Move, Rotate, Scale, Stretch,
- 5.5. Lengthen, Extend,
- 5.6. Chamfer, Fillet, etc.

Unit 6: Features: [6 Hours]

- 6.1. View tools,
- 6.2. Layers concept, match and change properties.
- 6.3. measure and divide
- 6.4. inquiry commands (Id, Distance, Area, List, Mass property etc
- 6.5. Working with Block, W-block and External References.
- 6.6. Drawing Exchange (convert to other format from drawing format and into drawing format)
- 6.7. Using drawing attributes, uses of pre defined objects etc.
- 6.8. Uses of script files.

Unit 7: Use of CADD in Civil Engineering Field: [6 Hours]

- 7.1. Land development and surveying,
- 7.2. CADD and Highway Engineering
- 7.3. CADD and Building Drawing
- 7.4. CADD with water supply and sanitary drawings

Unit 8: Plotters and Plotting the Drawing: [2 Hours]

Practical

Unit 1: Starting a New Drawing/Opening an existing drawing [5 Hours]

- 1.1. Setting up a drawing starting from scratch, using a Wizard, using and creating a template file, drafting aids.
- 1.2. Opening an existing drawing
- 1.3. Screen layout, pull-down menus, screen icons, command line and dialogue boxes, toggles keys, Screen organization.
- 1.4. Setting preferences (Setting Units and Scale, managing drawing area by using MVsetup and Limits.)

Unit 2: Drawing Commands**[5 Hours]**

- 2.1. Co-ordinate input methods (directive, absolute, relative and polar)
- 2.2. Point, Lines, Polyline, Multiline, Construction Lines
- 2.3. Circle, Arc, Ellipse, Donut
- 2.4. Polygon, Rectangle, Spline, , solids etc
- 2.5. Hatching
- 2.6. Text (multi-line & single line / true type fonts
- 2.7. Dimensions

Unit 3: Modify Commands**[5 Hours]**

- 3.1. Object selection
- 3.2. Erase, Trim, Break
- 3.3. Copy, Mirror, Offset, Array,
- 3.4. Move, Rotate, Scale, Stretch,
- 3.5. Lengthen, Extend,
- 3.6. Chamfer, Fillet, etc.

Unit 4: Features**[5 Hours]**

- 4.1. Layers concept, match and change properties.
- 4.2. Measure and divide
- 4.3. Inquiry commands
- 4.4. Model Space Viewports and Template Drawings
- 4.5. Uses of Script files
- 4.6. Drawing Exchange (convert to other format from drawing format and into drawing format)

Unit 5: Use of CADD in Civil Engineering Field**[20 Hours]**

Following drawings are to be prepared by using CADD software.

- 5.1. Architectural drawing of one storey residential building.
- 5.2. Cross section of Foundation - masonry wall, RCC columns (isolated)
- 5.3. Different types of staircases
- 5.4. Concept drawing of rebars of footing, slab, beam etc.
- 5.5. Symbol drawing of sanitary and water supply, electrical and communication etc.
- 5.6. Contour plotting with the help of Land development.

Unit 6: Plotters and Plotting the drawing in different scale**[5 Hours]****References:**

1. AutoCAD 2007 Textbooks (also above version)
2. AutoCAD Land Development (latest Version)
3. Mastering AutoCAD 2013 and AutoCAD LT 2013 by George Omura

Fourth Semester

Subjects:

- | | | |
|---|------------|--------------------------|
| 1 | EG 2206 SH | Social Studies |
| 2 | EG 2201 MG | Management |
| 3 | EG 2201 CE | Surveying II |
| 4 | EG 2202 CE | Estimating and Costing I |
| 5 | EG 2203 CE | Mechanics of Structure |
| 6 | EG 2204 CE | Soil Mechanics |
| 7 | EG 2205 CE | Water Supply Engineering |

सामाजिक अध्ययन

ई.जी. २२०६ एस.एच.

वर्ष : दोस्रो

सेमेष्टर : दोस्रो

जम्मा : २ घण्टा / हप्ता

प्रवचन : २ घण्टा / हप्ता

विशेष : घण्टा / हप्ता

प्रयोगात्मक : घण्टा / हप्ता

प्रयोगशाला : घण्टा / हप्ता

पाठ्यक्रमको परिचय :

सामाजिक अध्ययन विषयको पाठ्यक्रमको मूल उद्देश्य नेपालको वस्तुस्थिति विशेषतः भौगोलिक जानकारी संक्षेपमा दिई प्राविधिक विद्यार्थीहरूलाई नेपालका विविध पक्षबाट परिचित गराउनु हो। सामाजिक अध्ययनको पाठ्यक्रम डिप्लोमा इन्जिनियरिङ तहमा पढ्ने विद्यार्थीहरूका लागि इतिहास, संस्कृति, भूगोल, अर्थशास्त्र, राजनीतिशास्त्र, समाजशास्त्र, मानवशास्त्र, जनसंख्या शिक्षा, वातावरण शिक्षा आदिका विषयवस्तुलाई एकीकृत गरी निर्माण गरिएको छ।

पाठ्यक्रमको उद्देश्य :

यस पाठ्यक्रमको अध्ययनपछि मध्यम स्तरीय प्राविधिक विद्यार्थीहरू निम्नलिखित विषयमा सक्षम हुनेछन् :

- विश्वमानचित्रमा नेपालको परिचय दिन।
- नेपाल शब्दको उत्पत्तिबारे जानकारी दिन।
- सामाजिक विज्ञान-मानव र समाजको सामान्य जानकारी दिन।
- नेपालको आर्थिक व्यवस्थाको विशेषताहरूसहित कृषि, व्यापार, उद्योग, यातायात, सञ्चारको सामान्य परिचय दिन।
- नेपालको छिमेकी तथा मित्रराष्ट्र भारत र चीनसँगको सम्बन्धको छोटकरीमा परिचय तथा असंलग्न परराष्ट्र नीति, संयुक्त राष्ट्रसंघ, सार्कबारे छोटकरीमा जानकारी गराउन।
- नेपालको शासन व्यवस्थाका प्रमुख अङ्गहरू र संविधान, विकेन्द्रीकरणको सामान्य परिचय दिन।
- सामाजिक तथा सांस्कृतिक परिवर्तनसम्बन्धी जानकारी दिन।
- वातावरण, सामाजिक सेवा र सामुदायिक विकास, सामाजिक अनुसन्धान, जनसंख्या शिक्षासम्बन्धी सामान्य जानकारी दिन।

एकाइ

पाठ्यांश विवरण

पाठ घण्टा

एकाइ	पाठ्यांश विवरण	पाठ घण्टा
१.	सामाजिक अध्ययन तथा सामाजिक विज्ञानको परिचय	४
	क) सामाजिक अध्ययनको अर्थ, क्षेत्र, महत्व	२
	ख) सामाजिक अध्ययनको सामाजिक विज्ञानसँग सम्बन्ध	
	ग) सामाजिक अध्ययनको अन्य विषयसित सम्बन्ध	
	घ) सामाजिक अध्ययन र सामाजिक विज्ञानबीच भिन्नता	
	ङ) समाजशास्त्र र ग्रामीण समाजशास्त्रको परिचय	१
	च) समाजशास्त्रको प्रकृति र वैज्ञानिक पद्धति	
	छ) सामाजिक विज्ञान र भौतिक विज्ञानबीचको अन्तर	

	ज) विज्ञान र इन्जिनियरिङ	१
	झ) विज्ञान र प्रविधि	
	ञ) विज्ञान र धर्म	
	ट) विज्ञान र समाज	
२.	मानव र समाज	२
	क) समाज, संस्कृति र व्यक्तित्व, बानी, परम्परा र फेसन	१
	ख) जाति, भाषा, धर्म, पेसा, रहनसहन र चाडपर्व	१
	ग) समाजमा महिलाहरूको स्थिति	
३.	सामाजिक तथा सांस्कृतिक परिवर्तन	४
	क) सामाजिक तथा सांस्कृतिक परिवर्तनका अर्थ	१
	ख) सामाजिक तथा सांस्कृतिक परिवर्तनका सिद्धान्तहरू	
	ग) सामाजिक परिवर्तनको विशेषताहरू	१
	घ) सामाजिक र सांस्कृतिक परिवर्तनका कारक तत्वहरू	
	ङ) औद्योगिकीकरण र सामाजिक परिवर्तन	१
	च) ग्रामीण सामाजिक जनजीवनमा प्रविधिको प्रभाव	
	छ) औद्योगिक र ग्रामीण समाजका विशेषताहरू	१
	ज) सहरीकरण	
४.	वातावरण र पर्यावरण	१
	क) वातावरण र पर्यावरणको अर्थ	
	ख) वातावरण संरक्षणको आवश्यकता र महत्व	
५.	सामाजिक सेवा र सामुदायिक विकास	२.५
	क) सामुदायिक विकास परियोजनाको अर्थ र उद्देश्य	१
	ख) सामुदायिक विकास कार्यक्रम	
	ग) जनसहभागिता र सामुदायिक विकास	०.५
	घ) सामाजिक सेवाको अर्थ, क्षेत्र र उद्देश्य	१
	ङ) सामाजिक कार्यकर्ताको अर्थ, प्रकार, गुण र भूमिका	
६.	सामाजिक अनुसन्धान	२
	क) परिभाषा, प्रकृति, उद्देश्य र प्रकार	०.५
	ख) सामाजिक अनुसन्धानका प्रेरकताहरू	१.५
	ग) सामाजिक अनुसन्धानका प्रमुख चरण	
	घ) सामाजिक अनुसन्धान प्रतिवेदन तयार गर्ने ढाँचा	
७.	हावा स्रोतहरू	२
	क) मानवशक्ति	१
	ख) जलस्रोत	
	ग) भूमि	
	घ) वनसम्पदा	०.५
	ङ) खनिजशक्ति	
	च) सौर्यशक्ति	०.५
	छ) वायुशक्ति	
८.	नेपाल शब्दको उत्पत्ति	१
९.	विश्वमानचित्रमा नेपाल	१

१०.	आर्थिक अवस्था	२
	क) कृषि, व्यापार, उद्योग, यातायात र सञ्चारको महत्व	१
	ख) आर्थिक व्यवस्थाका विशेषताहरू	१
	कृषिजन्य अर्थव्यवस्था, मिश्रित अर्थव्यवस्था, साभा अर्थव्यवस्था, योजनाबद्ध विकास	
११.	परराष्ट्र नीति	३
	क) नेपालको असंलग्न परराष्ट्र नीतिको अर्थ	१
	ख) नेपालको परराष्ट्र नीतिका विशेषताहरू	
	ग) नेपाल भारत सम्बन्ध	०.५
	घ) नेपाल चीन सम्बन्ध	०.५
	ङ) संयुक्त राष्ट्रसंघ र नेपाल	१
	च) सार्क र नेपाल	
१२.	शासन व्यवस्था	३.५
	क) व्यवस्थापिका	०.५
	ख) कार्यपालिका	०.५
	ग) न्यायपालिका	०.५
	घ) संविधान, संविधानसभा, अन्तरिम संविधानको छोटो परिचय	१
	ङ) नेपाल अधिराज्यको संविधान २०४७ को विशेषताहरू	०.५
	च) विकेन्द्रीकरण, महत्व, आवश्यकता र विशेषताहरू	०.५
१३.	जनसंख्या शिक्षा	२
	क) जनसंख्या शिक्षाको परिचय	१
	ख) जनसंख्या शिक्षाको उद्देश्यहरू	
	ग) जनसंख्या वृद्धि र नियन्त्रण	१

पाठ्यपुस्तक

१. सामाजिक अध्ययन, सिद्धीश्वरमान श्रेष्ठ, डा. राजेन्द्रप्रसाद अधिकारी, सावित्री श्रेष्ठ, अक्षलोक, प्रकाशन, काठमाडौं ।

सन्दर्भ पुस्तक

१. नेपाल अधिराज्यको संविधान २०४७, कानून, न्याय तथा संसदीय व्यवस्था मन्त्रालय, कानून किताब व्यवस्था समिति, काठमाडौं, २०४७ ।
२. नेपाल अधिराज्यको संविधान २०४७ : एक टिप्पणी, खिमलाल देवकोटा, निरन्तर प्रकाशन, काठमाडौं, २०५८ ।
३. नेपाल परिचय, सिद्धीश्वरमान श्रेष्ठ, प्रा. श्यामकृष्ण जोशी, सावित्री श्रेष्ठ, अक्षलोक प्रकाशन, काठमाडौं, २०६५/०६९ ।
३. नेपालको अन्तरिम संविधान २०६३ ।
४. नेपालको सरकार र प्रशासन, सिद्धीश्वरमान श्रेष्ठ, अक्षलोक प्रकाशन, काठमाडौं, २०५० ।
५. नेपाली बृहत् शब्दकोष, नेपाल राजकीय प्रज्ञा-प्रतिष्ठान, काठमाडौं, २०५२ ।
६. नेपाली महिला र जनआन्दोलन २०६३, सावित्री श्रेष्ठ, अक्षलोक प्रकाशन, २०६३ ।
७. प्रश्नोत्तर नेपाल परिचय, सावित्री श्रेष्ठ, सिद्धीश्वरमान श्रेष्ठ, निरन्तर प्रकाशन, काठमाडौं, २०५०, २०५८ (दोस्रो संस्करण) ।
८. वातावरण शिक्षा स्रोत सङ्गालो, राष्ट्रिय संरक्षण कार्यनीति कार्यान्वयन आयोजना, काठमाडौं, २०५० ।
९. महत्वपूर्ण राजनीतिक शब्दज्ञान, सिद्धीश्वरमान श्रेष्ठ, अक्षलोक प्रकाशन, काठमाडौं, २०५५, २०५८, २०६६ ।
१०. मुद्रा, बैङ्किङ, राजस्व, अन्तर्राष्ट्रिय व्यापार तथा नेपालको अर्थव्यवस्था, महेश्वरमान श्रेष्ठ, रत्न पुस्तक भण्डार, काठमाडौं, २०५१ ।
११. राजनीतिशास्त्रको परिचय, सिद्धीश्वरमान श्रेष्ठ, निरन्तर प्रकाशन, काठमाडौं, २०५०, २०५८ (दोस्रो संस्करण) ।
१२. सामाजिक अनुसन्धान प्रविधि, प्रभाकर लाल दास, श्री जय नारायण, सप्तरी, २०५४ ।
१३. सामाजिक अध्ययन (हेल्थ साइन्स), सिद्धीश्वरमान श्रेष्ठ, सावित्री श्रेष्ठ, अक्षलोक प्रकाशन, काठमाडौं, २०६७ ।

Management

EG 2201 MG

Year: II
Semester: II

Total: 3 hours /week
Lecture: 3 hours/week
Tutorial: hours/week
Practical: hours/week
Lab: hours/week

Course description:

This course focuses on the familiarization of the basics of management that are essential for the management of various resources in the construction site.

Course objectives:

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

1. Understand the needs of management in the field of works;
2. Control and motivate the people working in the site;
3. Understand the organizational goals and guide the workers along with it;
4. Manage materials and equipment and
5. Maintain labor relation in the working field.

Course Contents:

Unit 1:	Organization:	[4 Hours]
	1.1 Introduction to Organization	
	1.2 Definition	
	1.3 Meaning	
	1.4 Purposes	
	1.5 Types of organization	
Unit 2:	Management:	[4 Hours]
	2.1 Introduction	
	2.2 Definition	
	2.3 Meaning and its concept	
	2.4 Importance	
	2.5 Management process	
Unit 3:	Motivations and Incentive:	[8 Hours]
	3.1 Definition	
	3.2 Theories of motivation-	
	3.2.1 Maslow's hierarchical need theory	
	3.2.2 Theory X and theory Y	

- 3.2.3. Herzberg's Hygiene theory
- 3.3 Incentives – meaning
- 3.4 Importance of incentives,
- 3.5 Different principles of incentives
 - 3.5.1. Reward and punishment,
 - 3.5.2. Carrot and stick
 - 3.5.3. Monetary and non-monetary incentives

Unit 4: Leadership: [4 Hours]

- 4.1 Meaning and definition
- 4.2 Sources of leadership power
- 4.3 Importance of leadership – difference between a manager and a leader,

Unit 5: Staffing: [5 Hours]

- 5.1 Meaning and Definition
- 5.2 Human Resource Management
 - 5.2.1. Acquisition
 - 5.2.2. Development
 - 5.2.3. Motivation, and
 - 5.2.4. Maintenance
- 5.3 Importance of HRM in an organization

Unit 6: Labor Relation : [4 Hours]

- 6.1 Meaning and purposes
- 6.2 Importance
- 6.3 Collective bargaining

Unit 7: Account: [8 Hours]

- 7.1 Book keeping and accounting
 - 7.1.1. Definition
 - 7.1.2. Importance
- 7.2 Principle of double entry
 - 7.2.1. Personnel account
 - 7.2.2. Property or Real account,
 - 7.2.3. Nominal account
- 7.3 Introduction to Journal, Ledger and Final account

Unit 8: Cost Accounting and Material Management: [8 Hours]

- 8.1 Cost accounting
 - 8.1.1. Meaning and Scope
 - 8.1.2. Elements of cost- Materials, Labor and other expenses
 - 8.1.3. Cost classification
- 8.2 Materials management
 - 8.2.1. Introduction,
 - 8.2.2. Inventory

- 8.2.3. Procurement- Objective and system of procurement
- 8.3 Store keeping
 - 8.3.1. Meaning,
 - 8.3.2. Objectives
 - 8.3.3. Role of a storekeeper

References:

1. Shrestha, S.M. and Shrestha, S. (2012). *Management-I*, Akshalok Prakashan, Kathmandu, Nepal.
2. DeCenzo, D.A. and Robbins, S.P. (1999.) *Personnel /Human Resource Management*, Third Edition. Prentice –Hall of India, New Delhi.
3. Boone, L.E. and Kurtz, D.L. (1992). *Management*, McGraw-Hill, Inc. New Delhi, India

Surveying II

EG 2201 CE

Year: II
Semester: II

Total: 8 hours /week
Lecture: 3 hours/week
Tutorial: hours/week
Practical: 5 hours/week
Lab: hours/week

Course description:

This course focuses on familiarization of different surveying techniques and equipment. The different surveying techniques include area, volume, coordinate system, and graphical and analytical method of mapping.

Course objectives:

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

1. Understand the concept of different surveying techniques of civil engineering field;
2. Apply modern survey techniques and
3. Use modern survey instruments for surveying, constructions and map making procedures.

Course Contents:

Theory

Unit 1: Contouring:

[7 Hours]

- 1.1 Definition - Contour interval, Horizontal equivalent, general contours, Index contour
- 1.2 Criteria for selection of contour interval
- 1.3 Characteristics of contours
- 1.4 Methods of control for contour survey
 - 1.4.1 Direct method
 - 1.4.2 Indirect method i.e. grid method, cross section method and radial method
- 1.5 Methods of interpolation of contours
- 1.6 Uses of contour maps
- 1.7 Field procedures and problems

Unit 2: Plane Tabling:

[6 Hours]

- 2.1 Definition and principles
- 2.2 Accessories used in plane tabling
- 2.3 Working operations - temporary adjustment and orientation
- 2.4 Methods of plane tabling
 - 2.4.1 Radiation, Intersection, Traversing and Resection (introduction only for resection)
- 2.5 Errors in plane table surveying
- 2.6 Merits and demerits of plane table surveying

Unit 3: Theodolite: [10 Hours]

- 3.1 Introduction and uses of theodolites
- 3.2 Geometry of theodolites
- 3.3 Classification of theodolites
- 3.4 Technical terms, fundamental lines and planes of theodolites
- 3.5 Working principle of theodolites
- 3.6 Temporary adjustment of theodolites
- 3.7 Measurement of angles
 - 3.7.1 Horizontal angles
 - 3.7.2 Vertical and zenithal angles
- 3.8 Laying out of horizontal angles
- 3.9 Errors in theodolites survey

Unit 4: Theodolite Traversing: [11 Hours]

- 4.1 Traverse definition, purpose, types and equipments
- 4.2 Traverse field works
- 4.3 Traverse adjustment and computation of total coordinates
- 4.4 Traverse plotting
- 4.5 Omitted measurements in traverse

Unit 5: Area and Volume Measurements: [11 Hours]

- 5.1 Basic definition
- 5.2 Area by division into simple figures
- 5.3 Area by different methods
 - 5.3.1 Area by coordinates
 - 5.3.2 Area by trapezoidal rule
 - 5.3.3 Area by Simpson's 1/3 rule
- 5.4 Volume by cross section
- 5.5 Volume by Trapezoidal formula
- 5.6 Volume by Prismoidal formula

Practical (Field works):

- 1. Perform Contouring on a sloped ground by indirect method (Grid method) [15 Hours]
- 2. Perform Plane tabling and detailing [15 Hours]
- 3. Measure area from plane table map [10 Hours]
- 4. Carryout Theodolite handling practices [10 Hours]
- 5. Perform traversing by Theodolite, computation, grid sheet making and plotting of traverse [25 Hours]

Evaluation of Practical: Continuous evaluation (Viva + Instrumentation + Objective test)

Textbooks:

1. Dr. BC Punmia, "Surveying"- Vol I & II, Laxmi Publication New Delhi

References:

1. R. Agor, " Surveying and Leveling" , Khanna Publication New Delhi
2. SK Duggal, "Surveying" Vol I & II, T ata MC Graw Hill Publishing
3. N Basnet & M Basnet , "Basic Surveying I", Benchmark Education Support Pvt, Ltd, Tinkune Katmmandu
4. N Basnet & M Basnet, " Basic Surveying II", Published by D. Shrestha & R. Shrestha, Rajmati Press, Lalitpur

Estimating and Costing I

EG 2202 CE

Year: II
Semester: II

Total: 7 hours /week
Lecture: 3 hours/week
Tutorial: hours/week
Practical: 4 hours/week
Lab: hours/week

Course description:

This course focuses on familiarization of estimating and costing of building works.

Course objectives:

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

1. Understand the estimated cost, actual cost and types of estimation;
2. Understand the procedures methods of measuring and quantifying the building works and
3. Prepare the estimating the cost of building works.

Course Contents:

Theory

Unit 1: Introduction:

[5 Hours]

- 1.1. Definition of estimate
- 1.2. Purpose of estimating
- 1.3. Estimate and the actual cost
- 1.4. Definition of terms
 - 1.4.1. Administrative approval
 - 1.4.2. Technical sanction
 - 1.4.3. Capital cost
 - 1.4.4. Schedule of rates
 - 1.4.5. Abstract of cost
 - 1.4.6. Bill of quantities
 - 1.4.7. Contingency
 - 1.4.8. Plinth area
 - 1.4.9. Carpet area
 - 1.4.10. Work charged establishment

Unit 2: Types of Estimates:

[8 Hours]

- 2.1 Approximate estimate
- 2.2 Detailed estimate
- 2.3 Revised estimate
- 2.4 Supplementary estimate
- 2.5 Annual repair and maintenance estimate
- 2.6 Extension and improvement estimate

- 2.7 Complete estimate of work/project
- 2.8 Split up of the cost of building work

Unit 3: Estimation of Building:

[16 Hours]

- 3.1. Data required for preparation of detailed estimate
- 3.2. Principle of units of measurement
- 3.3. Units of measurement and payment for various items of work
- 3.4. Limits of measurement and degree of accuracy
- 3.5. Methods of taking out quantities of building work
- 3.6. Methods of measurement of building and other civil engineering works
- 3.7. Various types of forms used in estimating
- 3.8. Preparation of detailed estimate

Unit 4: Analysis of Rates:

[16 Hours]

- 4.1. Introduction
- 4.2. Purpose of analysis of rates
- 4.3. Requirements of rate
- 4.4. Factor affecting rate analysis
- 4.5. Importance of rate analysis
- 4.6. Terms used in analysis of rates
 - 4.6.1. Overhead cost
 - 4.6.2. Task or out turn work
 - 4.6.3. Labour rate
 - 4.6.4. Material rate
 - 4.6.5. Through rate
- 4.7. Government procedure of preparing analysis of rates for building works
- 4.8. Estimating quantities of materials

Practical

[60 Hours]

Taking out detailed quantities and preparing estimate for the following:

1. Estimate a wall
2. Estimate one room building with RCC flat roof
3. Estimate one room building (having verandah) with RCC flat roof
4. Estimate two roomed RCC framed structure building
5. Estimate steel reinforcement of footing, RCC beam, column and slab
6. Estimate stone and brick masonry retaining walls
7. Estimate steel tubular truss and purlins
8. Estimate dog legged staircase
9. Estimate septic tank and soak pit
10. Perform approximate estimation of building works, road works water supply and sanitary works, irrigation work and bridge works
11. Determine approximate quantities of materials and labour for building based on CBRI, Rookee
12. Perform computerized estimation of quantities of building work

References:

1. Amarjit Aggarwal "Civil estimating quantity surveying and valuation" Katson Publishing House, Ludhiana, 1985
2. P.K. Guha "Quantity Surveying" (Principles and application Khanna Publishers

Mechanics of Structure

EG 2203 CE

Year: II
Semester: II

Total: 7 hours /week
Lecture: 4 hours/week
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2/2 hours/week

Course description:

This course is about structural analysis of statically determinate structures and properties of some materials used in structure. It is requisite for design of simple structures.

Course objectives:

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

1. Understand constitutive relation of some materials to be used in structures;
2. Identify stable and unstable and statically determinate and indeterminate structures;
3. Determine degree of static indeterminacy of statically indeterminate structures and
4. Analyze the simple determinate structures like truss, beam and frame.

Course Contents:

Theory

Unit 1. Introduction:

[4 Hours]

- 1.1 Definition of mechanics of structure.
- 1.2 Review on types of loads, types of supports. Their symbolic representation. Reactions on them and degrees of freedom.
- 1.3 Stability of structure (beam, frame and truss)
- 1.4 Introduction to statically determinate and indeterminate structures
- 1.5 Determination of degrees of static indeterminacies.

Unit 2. Simple Stress and Strain:

[12 Hours]

- 2.1 Concepts of stress and strain
- 2.2 Linear stress and strain and their relation, Hooke's law and Young's modulus of elasticity.
- 2.3 Deformation of uniform bar due to axial load
- 2.4 Stress strain curves for different materials.
- 2.5 Ultimate strength and working stress of materials and factor of safety.
- 2.6 Factors affecting factor of safety.
- 2.7 Thermal stress.
- 2.8 Stress and strains in plain and composite bars.
- 2.9 Poisson's ratio.
- 2.10 Shear stress shear strain and modulus of rigidity.
- 2.11 Volumetric strain and Bulk modulus.
- 2.12 Relation between Young's modulus, Bulk modulus and modulus of rigidity.

- Unit 3. Analysis of Plane Truss:** [8 Hours]
- 3.1 Definition and types of truss.
 - 3.2 Assumptions.
 - 3.3 External and internal forces in truss.
 - 3.4 Determination of internal forces in truss by method of joints and method of sections.
- Unit 4. Axial force, Shearing force and Bending moment:** [12 Hours]
- 4.1 Force actions in statically determinate beams.
 - 4.2 Definition of axial force, shear force and bending moment.
 - 4.3 Relation between shear force bending moment and applied load.
 - 4.4 Axial force, shear force and bending moment diagrams for statically determinate beam and frame under various types of loading.
 - 4.5 Point of contraflexure.
- Unit 5. Theory of Simple Bending:** [12 Hours]
- 5.1 Concept of bending and pure bending.
 - 5.2 Assumptions in theory of simple bending.
 - 5.3 Radius of curvature, neutral layer and neutral axis.
 - 5.4 Stress due to bending.
 - 5.5 Moment of resistance.
 - 5.6 Derivation of flexural formula (Relation between bending stress, radius of curvature and moment of resistance)
 - 5.7 Section modulus.
 - 5.8 Shearing stress in beams.
 - 5.9 Distribution of shear stress in rectangular cross section of beam.
 - 5.10 Definition of elastic curve, slope and deflection in a beam.
 - 5.11 Differential equation of elastic curve.
 - 5.12 Deflection of simply supported and cantilever beams by double integration method.
- Unit 6. Torsion:** [6 Hours]
- 6.1 Introduction.
 - 6.2 Definition of torque and angle of twist.
 - 6.3 Stress due to torsion.
 - 6.4 Derivation of torsional equation.
 - 6.5 Strength of solid and hollow circular shaft.
 - 6.6 Power transmitted by shaft.
- Unit 7. Simple Strut Theory:** [6 Hours]
- 7.1 Definition of column and strut.
 - 7.2 Stability of columns
 - 7.3 End conditions and their effects.
 - 7.4 Derivation of Euler's formula for columns
 - 7.5 Effective height.
 - 7.6 Slenderness ratio.
 - 7.7 Introduction to eccentrically loaded column.

Practical (Laboratory) [15 Hours]

- 1 Determine Young's modulus yield stress and ultimate strength of mild steel specimen (Stress-strain curve)
- 2 Measure strains and determination of forces in members of a model truss
- 3 Measure deflection of simple beams
- 4 Determine stability/buckling of columns

Textbooks:

1. G B Motra, "A text book of strength of materials" 2nd edition

References:

1. Surendra singh "Strength of materials" S. K. Kkataria and sons.
2. Ferdinand P. Beer E Russell Johnston "Mechanics of Materials" Mcgrow hill Book Company.

Soil Mechanics

EG 2204 CE

Year: II
Semester: II

Total: 7 hours /week
Lecture: 4 hours/week
Tutorial: 2 hours/week
Practical: hours/week
Lab: 2/2 hours/week

Course description:

This course is intended to give student a brief introduction to the field of soil mechanics and use of the basic data for analyzing various soil problems common to the civil engineering.

Course objectives:

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

1. Understand the fundamental and relevant principles of soil mechanics;
2. Have an overall picture of the behavior of soil;
3. Describe the nature of some of the soil problems encountered in civil engineering and
4. Formulate the basic technique and to develop the methodologies to solve the soil problem.

Course Contents:

Theory

Unit 1:	Introduction:	[2 Hours]
	1.1 Definition of soil	
	1.2 Soil mechanics	
	1.3 Objective of soil mechanics	
	1.4 Formation of soil and their types	
Unit 2:	Basic Terminology and Interrelations:	[4 Hours]
	2.1 Introduction	
	2.2 Phase diagrams	
	2.3 Void ratio, porosity, degree of saturation, unit weight, density, air content and percentage air voids	
	2.4 Interrelations	
Unit 3:	Index properties of Soil:	[6 Hours]
	3.1 Introduction	
	3.2 Specific gravity	
	3.3 Water content	
	3.4 Particle size distribution	
	3.5 Consistency of soils	
	3.6 Determination of field density	

Unit 4:	Soil Classification: 4.1 Purpose of soil classification 4.2 M.I.T classification system 4.2 Textural soil classification of soil 4.3 Unified soil classification of soil 4.4 Field identification of soil	[6 Hours]
Unit 5:	Soil Water and Effective Stress : 5.1 Types of soil water 5.2 Water table 5.3 Permeability 5.4 Seepage through soils 5.5 Darcy's Law 5.6 Determination of coefficient of permeability: laboratory methods 5.7 Principle of effective stress 5.8 Quick sand condition 5.9 Approximate stress distribution method for loaded areas	[9 Hours]
Unit 6:	Compaction: 6.1 Introduction 6.2 Standard proctor test 6.3 Field compaction methods 6.4 Factors affecting compaction 6.5 Compaction control	[4 Hours]
Unit 7:	Consolidation: 7.1 Introduction 7.2 Primary and secondary consolidation 7.3 Settlement 7.4 The spring analogy 7.5 The standard one-dimensional consolidation test 7.6 Pressure-void ratio curves 7.7 Co-efficient of compressibility 7.8 Co-efficient of volume change 7.9 Computation of consolidation settlement	[9 Hours]
Unit 8:	Shear Strength of Soils: 8.1 Introduction 8.2 Principle plane and principle stress 8.3 Mohr's circle for two dimensional stress system 8.4 Mohr-Coulomb failure theory 8.5 Determination of shear strength parameter 8.6 Direct shear test 8.7 Unconfined compression test	[6 Hours]

Unit 9:	Earth Pressure Theory:	[5 Hours]
	9.1 Introduction	
	9.2 Different types of lateral earth pressures	
	9.3 Rankine's earth pressure theory	
	9.4 Types of retaining walls	
	9.5 Principles of the design of retaining walls	

Unit 10:	Bearing Capacity:	[9 Hours]
	10.1 Introduction	
	10.2 Types of foundation	
	10.3 Basic definition	
	10.4 Gross and net foundation pressure	
	10.5 Terzaghi's bearing capacity theory	
	10.6 Bearing capacity of footing with finite dimensions	
	10.7 Effect of water table on bearing capacity	
	10.8 Settlement of foundation	

Practical (Laboratory)

[15 Hours]

1. Perform sieve analysis of Coarse grained soil (1 session)
2. Determine specific gravity by Pycnometer method(1 session)
3. Determine liquid limit and plastic limit(1 session)
4. Determine field density by Sand replacement method and Core cutter method(1 session)
5. Perform compaction test: Standard proctor test(1 session)
6. Perform direct shear test(1 session)
7. Perform unconfined compression test(1 session)

Text books:

1. K.R Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, Nai-sarak, New Delhi, 2005

References:

1. V.N.S Murthy "A Text Book of Soil Mechanics and Foundation Engineering in SI Units" UBS Distributors Ltd. Fourth Edition, 1993
2. Prof.T.N Ramamurthy, Prof.T.G Sitaram "Geotechnical Engineering, Soil Mechanics" S.Chand Publishing, New Delhi, Revised Edition, 2000
3. Dr. Sehgal "A text book of soil mechanics" S.B CBS Publishers and Distributors, New Delhi, 1988

Water Supply Engineering

EG 2205 CE

Year: II
Semester: II

Total: 6 hours /week
Lecture: 4 hours /week
Tutorial: 1 hour/week
Practical: hours/week
Lab: 2/2 hours/week

Course description:

This course focuses on familiarization of fundamental of water supply engineering terminology, principle, system management, different component of w/s design and construction.

Course objectives:

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

1. Assess the various water consumption categories;
2. Describe the sources and methods of water collection;
3. Explain and illustrate water transmission and distribution systems;
4. Describe and illustrate pipe fittings, valves accessories and layout;
5. Carry out qualitative and quantitative analysis of water;
6. Understand an overview of the water treatment process and
7. Outline and sketch the water treatment process.

Course Contents:

Theory

Unit 1: Introduction: [3 Hours]

- 1.1 Importance and necessity of planned water supply
- 1.2 Need for protected water supply
- 1.3 History of planned water supply system in Nepal
- 1.4 Impact of water supply (long term and short term impact)
- 1.5 Water supply and its impact on public health, women , and environment
- 1.6 Components of water supply system (Rural and Urban)

Unit 2: Sources of Water Supply: [6 Hours]

- 2.1 Hydrological Cycle
- 2.2 Surface Sources: River, Streams, Pond, Lake, Impounded reservoir
- 2.3 Ground Sources: Springs – gravity and artesian, Wells – shallow, deep, artesian and tube wells, Infiltration galleries
- 2.4 Alternative Water Sources: Rain Water Harvesting, Pani Ghainto, Conservation Pond , fog collection (introduction only)
- 2.5 Conservation and protection of sources
- 2.6 Selection of sources
- 2.7 Other issues to be addressed like water right problem

- Unit 3: Quantity of Water: [6 Hours]**
- 3.1 Per capita consumption: Per capita consumption for domestic, industrial, public and firefighting uses as per guidelines
 - 3.2 Type of water demand: domestic, livestock, commercial, industrial and public uses, firefighting and losses and wastage
 - 3.3 Design period: definition, factors affecting design period (selection basis)
 - 3.4 Population forecasting: necessity and methods
 - 3.5 Variation in water demand: types of variation, average demand , peak demand, peak factor, factors affecting water demand, socio-economic factors affecting water demand
 - 3.6 Numerical exercise on population forecasting, total water demand computation
- Unit 4: Intake: [4 Hours]**
- 4.1 Intake works
 - 4.2 Site selection for intake works
 - 4.3 Characteristics of different types of intake (spring, reservoir, and river intakes)
 - 4.4 Protection measures for intake works
- Unit 5: Quality of Water: [6 Hours]**
- 5.1 Wholesome Water, Potable Water, Contaminated Water
 - 5.2 Impurities in water, their classification and effects
 - 5.3 Hardness in water, types of hardness, alkalinity in water
 - 5.4 Living organisms in water: virus, algae, worms and bacteria
 - 5.5 Water related diseases: water borne, water washed, water based and water vector, transmission route, and preventive measures
 - 5.6 Drinking water quality standards (WHO, GoN)
 - 5.7 Water sampling and storing
 - 5.8 Physical analysis (temperature, colour, turbidity, taste and odour)
 - 5.9 Chemical analysis (total solids, pH, chlorine)
- Unit 6: Treatment of Water: [16 Hours]**
- 6.1 Objectives of water treatment
 - 6.2 Types of treatment process and impurity removal
 - 6.3 Screening: coarse and fine screens
 - 6.4 Plain Sedimentation: purpose, ideal sedimentation tank, types of sedimentation tank
 - 6.5 Sedimentation with coagulation: purpose, process, types of coagulant, Determination of optimum dose of coagulant, flocculation and clarifier
 - 6.6 Filtration: purpose and theory of filtration, types of filter – gravity and pressure filters - slow sand and rapid sand filter, Potable filter in emergency, filter media - sand and gravel
 - 6.7 Disinfection: purpose, methods of disinfection
 - 6.8 Chlorination: chlorine dose, residual chlorine, contact time, forms of chlorination - plain chlorination, break point chlorination, super chlorination and de-chlorination, factors affecting chlorination

- 6.9. Softening: removal of temporary hardness by boiling and lime treatment, removal of permanent hardness by lime soda, zeolite and ionization process
- 6.10. Miscellaneous treatments: aeration methods, removal of iron and manganese, domestic purification process

Unit 7: Distribution System: [4 Hours]

- 7.1. Distribution system: gravity, pumping, and dual system
- 7.2. Water storage (Reservoir): clear water reservoir, service reservoir
- 7.3. Layout of distribution system: dead end, grid iron, ring and radial system (introduction only)
- 7.4. Methods of water supply: continuous and intermittent system
- 7.5. Pressure in distribution system

Unit 8: Gravity Water Supply System: [4 Hours]

- 8.1. Concept of gravity water supply
- 8.2. Schematic diagram of a typical gravity water supply system
- 8.3. Pipeline design and hydraulic grade line
- 8.4. Break pressure tank
- 8.5. Public tap stand post
- 8.6. Residual head requirement

Unit 9: Conveyance of Water: [4 Hours]

- 9.1. Requirements of pipe material
- 9.2. Types of pipe: CI, GI, steel, PVC, polythene, PPR pipes
- 9.3. Laying procedure of pipes
- 9.4. Pipe joints and their types
- 9.5. Testing of pipe joints (leakage test)

Unit 10: Valves and Fittings: [4 Hours]

- 10.1. Service Connection
- 10.2. Water Meters, sluice valve , Gate Valves, Globe Valve, Ball Valve, Reflux Valve, Safety Valve, Air Release Valve, Drain Valve, Fire Hydrant, Bib Cock, Stop Cock, Bends, Tee, Elbow, Union, Cross, Reducer And Enlarger Shower, wash basin, shower, and sink
- 10.3. Operation and Maintenance

Unit 11: Water supply in Emergency Situation: [3 Hours]

- 11.1. Introduction: Sphere Guidelines
- 11.2. Quantity of water required in emergencies
- 11.3. Cleaning and disinfecting water sources, tanker, pot/utensils
- 11.4. Rehabilitation of small-scale piped water distribution systems, water treatment works after an emergency
- 11.5. Emergency treatment of drinking-water at the point of use

Tutorials:**[15 Hours]**

Drawing of:

- 1.1 Intake ; river, spring
- 1.2 Typical sedimentation tank
- 1.3 Filtration ; slow and rapid
- 1.4 Storage tank (RVT)
- 1.5 Break pressure tank
- 1.6 Tap stand
- 1.7 Layout of distribution system

Practical**[15 Hours]**

- 1.1 Determine physical parameters (Colour, Turbidity, Temperature)
- 1.2 Determine pH value
- 1.3 Perform jar test
- 1.4 Determine total solids
- 1.5 Determine dissolved oxygen

References:

1. Birdie, G.S. and Birdie, J.S, Water Supply and Sanitary Engineering, Dhanapat Rai & Sons Publishers, Nai Sarak, Delhi- 110006, India.
2. Dr. Punmia B C, Jain A, and Jain, A, Water Supply Engineering, Laximi Publications (P) Ltd, New Delhi
3. Barry, R, The Construction Of Building (Volume 4) Building Services, Affiliated East- west Press Pvt. Ltd., New Delhi

Third Year
(Fifth and Sixth Semesters)

Fifth Semester

Subjects:

- | | | |
|---|------------|-------------------------------|
| 1 | EG 3101 CE | Surveying III |
| 2 | EG 3102 CE | Estimating and Costing II |
| 3 | EG 3103 CE | Structural Design and Drawing |
| 4 | EG 3104 CE | Highway Engineering I |
| 5 | EG 3105 CE | Sanitary Engineering |
| 6 | EG 3106 CE | Construction Management |
| 7 | EG 3107 CE | Minor Project (Survey Camp) |

Surveying III

EG 3101 CE

Year: III
Semester: I

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: hours/week

Course description:

This course focuses on familiarization of different surveying techniques and equipment. The different surveying techniques include computation, and setting out of curves, optical and electronic distance measurement.

Course objectives:

After completion of this course students will able to:

1. Apply different techniques of civil engineering survey;
2. Perform traverse survey, detailing, heightening, curves design, and lay out techniques and
3. Carryout building layout techniques.

Course Contents:

Theory

Unit 1: Trigonometric Leveling:

[7 Hours]

- 1.1 Introduction
- 1.2 Different cases of trigonometric leveling
- 1.3 Refraction and curvature correction by linear method
- 1.4 Field procedures and problems

Unit 2: Stadia Tacheometry:

[13 Hours]

- 2.1 Introduction
- 2.2 Instrument used for tacheometry
- 2.3 Different system of tacheometric measurements
- 2.4 Stadia method - Distance and elevation formula for horizontal line of sight and inclined line of sight with staff vertical
- 2.5 Tangential method and different cases for distance and elevation computation
- 2.6 Horizontal base subtense method
- 2.7 Stadia field procedures
- 2.8 Self reducing tacheometer, Introduction of Total Station
- 2.9 Errors in stadia tacheometry

Unit 3: Horizontal Curves: [12 Hours]

- 3.1 General definition and purposes
- 3.2 Classification of horizontal curves
- 3.3 Designation of curves
- 3.4 Elements of simple circular curve
- 3.5 Design and setting out of curves
 - 3.5.1 Linear method – by ordinates from long chord, offset from tangents
 - 3.5.2 Deflection angle method – by Rankine's method, two theodolite method

Unit 4: Vertical Curves: [8 Hours]

- 4.1 Definition and purposes
- 4.2 Types of vertical curves
- 4.3 Length of vertical curves
- 4.4 Computation and setting out of vertical curves by tangent correction and parabolic equation method

Unit 5: Transition and Composite Curves [5 Hours]

- 5.1 Introduction and purposes
- 5.2 Classification of transition curves
- 5.3 Elements of transition curves

Practical (Field Works)

- 1. Perform trigonometric leveling for determining height of different targets (accessible and Inaccessible cases) [10 Hours]
- 2. Perform tacheometric surveying by stadia method and tangential method for producing Topographic map in semi built up area [15 Hours]
- 3. Set out simple circular curve, transition curve and composite curves by linear and angular method [15 Hours]
- 4. Set out simple building by linear and angular method [5.0 Hours]

Evaluation of Practical: Continuous evaluation (Viva + Instrumentation + Objective test)

Textbooks:

- 1. BC Punmia, "Surveying Vol I and II", Laxmi Publication New Delhi.

References:

- 1. R Agor, "Surveying and Leveling", Khanna Publication New Delhi.
- 2. SK Duggal, "Surveying VOL I and II", Tata MC Graw Hill Publishing.
- 3. N Basnet and M Basnet, "Basic Surveying-I", Benchmark Education Support Pvt. Ltd, Tinkune Kathmandu.
- 4. N Basnet and M Basnet, "Basic Surveying –II", Published by D. Shrestha & R. Shrestha Rajmati Press, Lalitpur.

Estimating and Costing II

EG 3102 CE

Year: III
Semester: I

Total: 7 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 4 hours/week
Lab: hours/week

Course description:

This course focuses on familiarization of estimating and costing and specifications of road works and water supply and sanitary works and valuation of existing property.

Course objectives:

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

1. Understand the procedures, methods of measuring and quantifying the road and restoration work;
2. Calculate the quantities of earthwork of road in plan and hilly area;
3. Analyze rate of road and water supply and sanitation works;
4. Provide basic knowledge of the value of existing property and role of computers in valuation;
5. Provide basic knowledge of specifications building and road works and
6. Prepare estimate of road and restoration works.

Course Contents:

Theory

Unit 1 Introduction:	[3 Hours]
1.1. Terms use in Earthwork in road construction	
1.2. Method of estimating of road and restoration works	
Unit 2 Earthwork in road construction:	[10 Hours]
2.1 Various methods of earthwork calculation in road work	
2.2 Earthwork calculation of road work in plain area	
2.3 Earthwork calculation of road work having vertical drop	
2.4 Earthwork calculation of road work in highly area	
Unit 3 Analysis of rules (for road and sanitary and water supply):	[10 Hours]
3.1. Task or outturn work	
3.2. Factor's affecting the cost of road and sanitary and water supply works	
3.3. Govt. procedure of preparing rate analysis of road and sanitary and water supply works	
Unit 4 Valuation:	[10 Hours]
4.1. Definition	
4.2. Purpose of valuation	

- 4.3. Principle of valuation
- 4.4. Factors affecting the value of propose
- 4.5. Definition of terms used in valuation
- 4.6. Method of valuation
- 4.7. Method of writing valuation report

Unit 5 Specifications:

[12 Hours]

- 5.1. Definition
- 5.2. Purpose of specification
- 5.3. Types of specification
- 5.4. Necessity of specification
- 5.5. Technique of specification
- 5.6. Paragraph of specification
- 5.7. Detailed specification for:
 - a) Building work :
 - earthwork in excavation
 - plain content concrete work
 - steel reinforcement
 - form work
 - brick masonry work
 - stone masonry work
 - wood work for doors and windows frame and shutters
 - cement sand plaster work
 - CGI sheet roofing
 - b) Road works:
 - embankment construction
 - sub-grade
 - base course
 - WBM road
 - surface dressing using hot bitumen
 - premix capet

Practical:

[60 Hours]

Taking out detailed quantities and preparing estimate for the following:

- 1 Estimate two storey RCC framed structure building having a flat roof
- 2 Calculate earthwork in road construction by three methods
- 3 Calculate earthwork of road in plain area
- 4 Calculate earthwork of road having vertical drop
- 5 Calculate earthwork of road in highly area
- 6 Estimate metalled road of one KM
- 7 Evaluate report of existing properly
- 8 Estimate restoration work of road

References:

- 1 Amarjit Aggrawal "civil estimating quantity surveying and valuation, " Katson publishing house, Ludhiana, 1985.
- 2 M. Charkaborti "estimating, costing, specifications and valuation in civil engineering"
- 3 G.S. Berdie "text book of estimating and costing".

Structural Design and Drawing

EG 3103 CE

Year: III
Semester: I

Total: 10 hours /week
Lecture: 5 hours/week
Tutorial: 3 hours/week
Practical: 2 hours/week
Lab: hours/week

Course description:

This course focused on giving the general ideas and design of steel, timber and reinforced concrete structures.

Course objectives:

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

1. Identify material and structural elements of steel, timber and RCC structures;
2. Understand concept of design and codal provisions and
3. Design simple structural elements.

Course Contents:

Theory

Unit 1: Introduction:	[4 Hours]
1.1 Introduction to steel structures	
1.2 Types & properties of steel	
1.3 Allowable stresses in structural steel	
1.4 Use of steel as a structural member in construction	
1.5 Codes of practice for design of steel structures	
1.6 Advantage and disadvantage of steel structures	
1.7 Different types of load on roof truss	
Unit 2: Joints in the Steel Structures :	[4 Hours]
2.1. Types of riveted and bolted joints	
2.2. Types of failure of riveted and bolted joints	
2.3. Rivets value and efficiency of joints	
2.4. Welded joints	
Unit 3: Design & Details of Joints :	[8 Hours]
3.1. Design of riveted bolted joints under axial force	
3.2. Details of riveted and bolted joints under axial forces	
3.3. Design of welded joints under axial forces	

Unit 4: Design of Tension of Members: [6 Hours]

- 4.1. Types of tension members
- 4.2. Net sectional area
- 4.3. Design of members subjected to axial load

Unit 5: Axially loaded Compression Members (Tubular)and angle section): [8 Hours]

- 5.1. End condition & Effective lengths
- 5.2. Radius of gyration and slenderness ratio
- 5.3. Strength of compression members
- 5.4. Design of compressive members

Unit 6: Design of Roof Trusses: [4 Hours]

- 6.1. Different types of loads on roof truss
- 6.2. Introduction to the design of roof trusses:
- 6.3. Tubular sections

Unit 7: Timber Structures: [3 Hours]

- 7.1. Introduction of timber
- 7.2. Properties of timber
- 7.3. Use of timber as a structural member in construction
- 7.4. Code of practice of design of timber structures
- 7.5. Advantage & disadvantage of timber structure

Unit 8: Design of Timber Structure: [6 Hours]

- 8.1. Design of compression member
- 8.2. Design of solid rectangular beam
- 8.3. Check of deflections
- 8.4. Types of joints and their connection

Unit 9: Design Concept of Reinforced Concrete: [6 Hours]

- 9.1. Properties of concrete and steel reinforcement
- 9.2. Behavior of reinforced concrete in bending
- 9.3. Methods of design of a reinforced concrete section
- 9.4. Concept of modular ratio, permissible and ultimate stress
- 9.5. Description of ultimate load and limit state method

Unit 10: R.C Section in Bending: [6 Hours]

- 10.1. Basic assumption (working stress method)

- 10.2. Stress – strain diagram
- 10.3. Position of neutral axis
- 10.4. Moment of resistance
- 10.5. Under reinforcement, over reinforcement, and balanced sections
- 10.6. Analysis of singly and doubly reinforcement rectangular sections
- 10.7. Analysis of singly reinforced flanged sections
- 10.8. Flexure design of rectangular and flanged section
- 10.9. Design of one way and two way slabs using IS Code

Unit 11: Shear and Bonds for R.C. Sections: [6 Hours]

- 11.1. Behavior of a R.C. section in shear
- 11.2. Shear resistance of reinforced section
- 11.3. Types of shear reinforcement
- 11.4. Strength of vertical links (stirrups)
- 11.5. Design of vertical stirrups
- 11.6. Local and anchorage bond
- 11.7. Anchorage lengths
- 11.8. Bar curtailment

Unit 12: Axial Loaded R.C. Columns: [8 Hours]

- 12.1. Short and long columns
- 12.2. Types of compression members
- 12.3. Design of a RCC column
- 12.4. Reinforcement detailing
- 12.5. Code requirements

Unit 13: Introduction to the Limit State Method: [6 Hours]

- 13.1. General introduction
- 13.2. Use of IS-456 and Tables of SP 16 for the design of :
 - 13.2.1. Singly reinforcement beam
 - 13.2.2. Doubly reinforcement beam
 - 13.2.3. Axially and uni-axially loaded columns

Practical: [30 Hours]

Design and draw followings:

- 1. Singly reinforcement rectangular beams
- 2. Doubly reinforcement rectangular beams
- 3. Singly reinforcement T – beams
- 4. One way slabs (simply supported, cantilever and overhang)
- 5. Two way slab
- 6. Short and long columns (axially loaded)
- 7. Simple pad footings for columns
- 8. Preparation of bar bending schedule for all RC drawings
- 9. Details riveted and welded joints.

10. Steel beam column connection and column bases
11. Steel roof truss joint details
12. Timber roof truss joint details
13. Timber beam and column

References:

1. Dr Rajan Suwal, "Design of Steel and Timber Structures", R & R Group, Kathmandu
2. P. Dayaratnam, "Design of Reinforced Concrete Structures", Oxford & IBH Publishing Company.
3. S. Negi, "Design of Steel & Timber Structures", Tata McGraw Hill Publishing Co., New Delhi.
4. Dr Rajan Suwal, "Design of Reinforced Concrete Structures", A.K. Book Publication, Kathmandu

Highway Engineering I

EG 3104 CE

Year: III
Semester: I

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

Course description:

This course is aimed to provide general background knowledge of highway engineering putting emphasis on alignment survey, geometric design, drainage, highway materials.

Course objectives:

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

1. Describe highway alignments and conduct its engineering survey;
2. Understand the principles of geometric design, both vertical and horizontal together with drainage components of highway;
3. Differentiate between the various types of materials used in road construction and
4. Perform different test of road construction materials.

Course Contents:

Unit 1: Introduction to Transportation System:

[6 Hours]

- 5.1. Introduction
- 5.2. Comparison of different modes of transportation system, suitability of each mode in Nepal
- 5.3. Road transport and its advantages/disadvantages
- 5.4. History of road development
 - 1.4.1 Roman roads construction technique
 - 1.4.2 Tresaguet road construction technique
 - 1.4.3 Telford road construction technique
 - 1.4.4 Macadam road construction technique
 - 1.4.5 Modern roads
- 5.5. Road construction in Nepal
- 5.6. Road classification as per Nepal Road Standard (functional classification only)
- 5.7. Urban road patterns
 - 1.7.1 Grid iron pattern
 - 1.7.2 Radial pattern

Unit 2: Highway Alignment and Engineering Survey:

[4 Hours]

- 2.1. Introduction
- 2.2. Requirements of ideal highway alignment
- 2.3. Factors controlling highway alignment
- 2.4. Engineering survey for highway alignment
 - 2.4.1. Map study
 - 2.4.2. Reconnaissance,
 - 2.4.3. Preliminary survey
 - 2.4.4. Final location and detailed survey

Unit 3: Geometric Design of Highways:

[20 Hours]

- 3.1. Introduction
- 3.2. Basic road terms
 - 3.2.1. Traffic volume
 - 3.2.2. Traffic capacity
 - 3.2.3. Skid/slip
- 3.3. Cross sectional elements
 - 3.3.1. Typical drawings of highway cross sections, rural roads/ urban roads
- 3.4. Camber
 - 3.4.1. Definition
 - 3.4.2. Objectives
 - 3.4.3. Types
 - 3.4.4. camber board preparation with numerical example
- 3.5. Highway curves
 - 3.5.1. Types
 - 3.5.2. Necessity
 - 3.5.3. Design of horizontal curves (Effect of centrifugal force)
- 3.6. Superelevation
 - 3.6.1. Definition
 - 3.6.2. Objectives
 - 3.6.3. Analysis of superelevation with numerical example of superelevation design in mixed traffic condition
 - 3.6.4. Methods of providing superelevation
- 3.7. Extrawidening
 - 3.7.1. Definition
 - 3.7.2. Objectives
 - 3.7.3. Analysis of mechanical widening with numerical example for calculating total widening
 - 3.7.4. Methods of providing extrawidening
- 3.8. Sight distance
 - 3.8.1. Definition
 - 3.8.2. Types

- 3.8.3. Objectives
- 3.8.4. Examples of situations restricting sight distance
- 3.8.5. Numerical example of calculation of stopping sight distance
- 3.9. Gradient
 - 3.9.1. Definition
 - 3.9.2. Types
 - 3.9.3. Factors governing the selection of grades, effect of high grades)
 - 3.9.4. Grade compensation in horizontal curves (reasons)
- 3.10. Vertical curves
 - 3.10.1. Definition
 - 3.10.2. Types
 - 3.10.3. Design of summit curves (minimum length requirement based on stopping sight distance with numerical example)
 - 3.10.4. Design of valley curves (minimum length requirement based on both comfort and head light sight distance with numerical example)

Unit 4: Highway Drainage:

[5 Hours]

- 4.1. Introduction and important of highway drainage
- 4.2. Causes of moisture variation in subgrade soil
- 4.3. Requirements of good drainage system
- 4.4. Classification of highway drainage system
 - 4.4.1. Surface drainage
 - 4.4.2. Subsurface drainage
 - 4.4.3. Cross drainage
 - 4.4.4. Energy dissipating structures
- 4.5. Surface drainage system (longitudinal drainage types like lined/unlined, rural/urban/hill road drainage system)
- 4.6. Subsurface drainage system
 - 4.6.1. Seepage flow
 - 4.6.2. Water table
 - 4.6.3. Capillary rise)
- 4.7. Cross drainage structures
 - 4.7.1. Culverts (pipe, slab, box, arch)
 - 4.7.2. Component parts of culvert
 - 4.7.3. Causeways
 - 4.7.4. Typical drawings of pipe culvert/slab culvert

Unit 5: Highway Materials:

[10 Hours]

- 5.1. Classification of highway materials
- 5.2. Subgrade soil
 - 5.2.1. Uses
 - 5.2.2. Requirements of soil as a highway material

- 5.2.3. California Bearing Ratio test of soil
- 5.3. Stone aggregates
 - 5.3.1. Definition
 - 5.3.2. Types
 - 5.3.3. Desirable properties of road aggregates
 - 5.3.4. Tests on road aggregates (Los Angeles Abrasion test, Aggregate Impact test, Water absorption test, Specific Gravity test, Shape test)
- 5.4. Binding materials (bituminous material):
 - 5.4.1. Introduction
 - 5.4.2. Types of binding materials (bitumen, tar), natural bitumen, petroleum bitumen, cutback bitumen, bituminous emulsion
- 5.5. Tests on bitumen: penetration test, ductility test, viscosity test, softening point test

References:

1. Dinesh Kumar Shrestha, Anil Marsani, Transportation Engineering volume 1, Jasni Publications, Mid Baneshwor, Kathmandu, Nepal, 2013.
2. Partha Mani Parajuli, Course Manual on Transportation Engineering I. IoE, Pulchowk, Lalitpur, Nepal.
3. C E G Justo, S K Khanna, Highway Engineering, Khanna Publications, New Delhi, India
4. Ajay K Duggal, Vijaya P. Puri, Laboratory manual on Highway Engineering, 1991, New Age International (P) Limited, New Delhi, India.
5. S. K. Sharma, Principles, Practice and Design of Highway Engineering, S Chand and Company Ltd. New Delhi, 1985.

Sanitary Engineering

EG 3105 CE

Year: III
Semester: I

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

Course description:

The course aims at developing fundamental knowledge of sanitary engineering such as sewerage system, preliminary sewage treatment system, on site sanitation systems and solid waste management.

Course objectives:

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

1. Understand the basic knowledge on sanitation and health, main diseases transmitted due to unsanitary excreta disposal;
2. Understand the basic knowledge on wastewater collection, conveyance, treatment and disposal methods and design of sewers;
3. Be familiar with the fundamental problems, issues related to wastewater and its management;
4. Describe the onsite sanitation systems and
5. Explain the importance and methods of solid waste disposal.

Course Contents:

Unit 1: Introduction:

[6 Hours]

- 1.1. Sanitation and health
- 1.2. Main diseases transmitted by unsanitary excreta disposal
- 1.3. Transmission routes
- 1.4. Preventive measures
- 1.5. Importance of sanitation, awareness of public health engineering
- 1.6. Definitions of common terms used in sanitary engineering
 - 1.6.1. Sewage/wastewater, domestic sewage, industrial sewage, sanitary sewage, storm water
 - 1.6.2. Sullage, sewer, sewerage, rubbish, garbage, refuse and solid waste
- 1.7. System of sanitation
 - 1.7.1. Conservancy system with merits and demerits
 - 1.7.2. Water carriage system with merits and demerits
- 1.8. Sewerage systems and types
 - 1.8.1. Separate system
 - 1.8.2. Combined system
 - 1.8.3. Partially separate system
 - 1.8.4. Comparison in tabular form between separate and combined systems

Unit 2: Quantity of Sewage: [4 Hours]

- 2.1. Sources of sanitary sewage
- 2.2. Dry Weather Flow (DWF) and Wet Weather Flow (WWF)
- 2.3. Factors affecting quantity of sanitary sewage
- 2.4. Determination of quantity of sanitary sewage - peak factor, peak flow, minimum and maximum flows
- 2.5. Determination of quantity of storm water- Rational method and its limitation, Overall runoff coefficient, intensity of rainfall, Time of concentration
- 2.6. Numerical on determination of quantity of wastewater for separate, combined and partially separate systems

Unit 3: Design and Construction of Sewers: [4 Hours]

- 3.1. Shapes of sewer
- 3.2. Sewer Materials - salt glazed stoneware, cement concrete, cast iron
- 3.3. Design criteria of sewers - design period, minimum and maximum velocities, self cleansing velocity, sewer size range, sewer gradient
- 3.4. Hydraulic formulae for design Manning's, and Hazen Williams formulae, hydraulic elements of circular sewers for partial flow condition, partial flow diagrams
- 3.5. Numerical on design of circular and rectangular sewers

Unit 4: Sewer Appurtenances (only introduction): [4 Hours]

- 4.1. Necessity of sewer appurtenances
- 4.2. Construction of sewer appurtenances- (location , function and construction)
 - 4.2.1. Manhole
 - 4.2.2. Drop manhole
 - 4.2.3. Street inlets
 - 4.2.4. Catch basin
 - 4.2.5. Flushing device
 - 4.2.6. Inverted siphon
 - 4.2.7. Ventilating shaft
 - 4.2.8. Water closet
 - 4.2.9. Trap

Unit 5: Sampling and Characteristics of Wastewater (introduction only): [3 Hour]

- 5.1. Sampling of wastewater - grab and composite samples
- 5.2. Biochemical Oxygen Demand (BOD)
- 5.3. Chemical Oxygen Demand (COD)
- 5.4. Decomposition of wastewater-process, aerobic and anaerobic decomposition, reactions
- 5.5. Wastewater disposal Standards

Unit 6: Wastewater Disposal: [5 Hours]

- 6.1. Necessity and objectives of wastewater disposal
- 6.2. Wastewater disposal by Dilution process and essential conditions for dilution
- 6.3. Self purification of rivers/streams and sag curve
- 6.4. Wastewater disposal by land treatment and Suitability of land treatment

- 6.5. Methods of land treatment - irrigation, overland flow and rapid infiltration, Broad irrigation and sewage farming, Methods of application of sewage on land - flooding, surface irrigation, ridge and furrow method, subsurface irrigation and spray irrigation
- 6.6. Sewage sickness and its prevention

Unit 7: Wastewater Treatments: [9 Hours]

- 7.1. Objectives of wastewater treatment
- 7.2. Treatment process types and impurity removal
- 7.3. Primary treatment process
 - 7.3.1. Racks and Screens - purpose and types, design criteria, construction, working and maintenances
 - 7.3.1.1. Skimming tank – purpose and types, design criteria, construction, working and maintenances
 - 7.3.2. Grit chamber - purpose and types, design criteria, construction, working and maintenances
- 7.4. Waste stabilization pond - purpose and types, design criteria, construction, working and maintenances
- 7.5. Constructed wetland - purpose and types, design criteria, construction, working and maintenances
- 7.6. Numerical on design of Racks and Screens, Skimming tank, Grit chamber, Waste stabilization pond and Constructed wetland

Unit 8: On site Sanitations for Isolated / Unsewered Area: [8 Hours]

- 8.1. Necessity
- 8.2. On site sanitation - Definition and types
- 8.3. Pit privy - purpose and construction
- 8.4. Ventilated Improved Pit (VIP) latrine - purpose, construction, design criteria,
- 8.5. Compost latrine- purpose and types, design criteria, construction, working and maintenances
- 8.6. Septic tank - purpose, construction, design criteria, working and maintenance
- 8.7. Disposal of septic tank effluent methods
- 8.8. Drain field - purpose, construction and design criteria
- 8.9. Soak pit - purpose, construction and design criteria
- 8.10. Leaching cesspool - purpose
- 8.11. Numerical on design of latrine, Septic tank and Soak pit

Unit 9: Solid Waste Disposal: [2 Hours]

- 9.1. Importance of solid waste disposal
- 9.2. Collection and transportation methods
- 9.3. Methods of solid waste disposal
 - 9.3.1. Dumping
 - 9.3.2. Sanitary landfill
 - 9.3.3. Incineration
 - 9.3.4. Composting

Tutorials:

- | | |
|---|------------------|
| 1.0 Introduction | [1 Hour] |
| Definitions | |
| 2.0 Quantity of Wastewater | [2 Hours] |
| Definitions, Numerical on determination of sanitary sewage and storm water, determination on quantity of wastewater for separate, combined and partially separate systems | |
| 3.0 Design and Construction of Sewers | [2 Hours] |
| Design criteria of sewers, partial flow conditions in sewers, Numerical on design of circular and rectangular sewers for separate and combined systems | |
| 4.0 Sewer Appurtenances | [2 Hours] |
| Definitions and sketches | |
| 5.0 Sampling and Characteristics of Wastewater | [1 Hour] |
| Definitions, standards | |
| 6.0 Wastewater Disposal | [1 Hour] |
| Definitions, drawing sag curve | |
| 7.0 Wastewater Treatment | [2 Hours] |
| Numerical on design of Racks and Screens, Skimming tank, Grit chamber, Waste stabilization pond and Constructed wetland | |
| 8.0 Disposal of Sewage from Isolated Buildings | [3 Hours] |
| Definitions, Numerical on design of VIP latrine, Pour flush latrine, Septic tank and Soak pit | |
| 9.0 Solid Waste Disposal | [1 Hour] |
| Definitions, purpose, classification | |

References:

1. B. C. Punmia and Ashok Jain, "Wastewater Engineering", Laxmi Publications (P) Ltd., New Delhi, 1998.
2. P.N. Modi, "Sewage Treatment & Disposal and Wastewater Engineering", Standard Book House, Delhi, 2001.
3. G.S. Birdie and J.S. Birdie, "Water Supply and Sanitary Engineering", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2002.
4. K.N. Duggal, "Elements of Environmental Engineering", S. Chand and Company Ltd., New Delhi, 1997.

Construction Management

EG 3106 CE

Year: III
Semester: I

Total: 5 hours/week
Lecture: 4 hours/week
Tutorial: 1 hour/week
Practical: hours/week
Lab: hours/week

Course description:

This course focuses on management of construction works. This course imparts knowledge on accounts, procurement of works, contract management, planning, scheduling, and managing construction works.

Course objectives:

After completion of this course students will be able to:

1. Acquire basic knowledge on management of construction works;
2. Plan and schedule different activities of construction project;
3. Plan and schedule resources required in construction project and
4. Understand basic knowledge of procurement/contract management.

Course Contents:

Unit 1: Introduction:

[4 Hours]

- 1.1 Definition of Project
- 1.2 Characteristics of Project
- 1.3 Definition of Management
- 1.4 Need of Construction Management
- 1.5 Functions of Construction Management

Unit 2: Project Planning and Scheduling:

[12 Hours]

- 2.1 Definition of Planning
- 2.2 Steps in Planning
- 2.3 Importance of Planning
- 2.4 Construction Site Planning
- 2.5 Work Breakdown Structure
- 2.6 Bar Chart
- 2.7 Linked Bar Chart and Milestone Chart
- 2.8 Advantages of Construction Schedule
- 2.9 Preparation of Construction Schedule
- 2.10 Material Schedule
- 2.11 Labor Schedule
- 2.12 Equipment Schedule
- 2.13 Financial Schedule

Unit 3: CPM and PERT: [14 Hours]

- 3.1 Introduction to CPM
- 3.2 Elements of Network
- 3.3 Network Rules
- 3.4 Definition of the Terms: Network Diagram, Activity, Event, Forward Pass, Backward Pass, Critical Path
- 3.5 Determination of Critical Paths and Floats
- 3.6 Introduction to PERT

Unit 4: Contract Administration and Accounts: [12 Hours]

- 4.1 Definition of Contract
- 4.2 Essentials elements of a Valid Contract
- 4.3 Types of Construction Contracts
- 4.4 Information to be given in Tender Notice
- 4.5 Tender Document
- 4.6 Bid Bond and Performance Bond
- 4.7 Contract Document
- 4.8 Conditions of Contract
- 4.9 Supervising Work of a Contractor
- 4.10 Duties and Responsibilities of a Site Supervisor
- 4.11 Site Order Book
- 4.12 Materials at Site Account
- 4.13 Muster Roll
- 4.14 Measurement Book
- 4.15 Running Bill and Final Bill
- 4.16 Completion Report
- 4.17 Relation between Owner, Consultant, and Contractor

Unit 5: Quality: [3 Hours]

- 5.1 Definition of Quality
- 5.2 Characteristics of Quality
- 5.3 Factors affecting Quality
- 5.4 Stages of Quality Control

Unit 6: Monitoring, and Control: [5 Hours]

- 6.1. Introduction to Monitoring
- 6.2. Purpose of Monitoring
- 6.3. Introduction to Control
- 6.4. Elements of Control: Quality, Cost, and Time
 - 6.4.1. Quality Control
 - 6.4.2. Cost Control
 - 6.4.3. Time/Schedule Control

Unit 7: Construction Equipment:

[6 Hours]

- 7.1. Advantages of using Construction Equipment
- 7.2. Equipment for Excavation
- 7.3. Equipment for Concrete Mixing
- 7.4. Equipment for Transportation and Compaction
- 7.5. Equipment for Lifting of Materials and Parts

Unit 8: Safety:

[4 Hours]

- 8.1. Introduction to Accidents
- 8.2. Causes of Accidents
- 8.3. Importance of Safety
- 8.4. Safety Measures

References:

1. Adhikari, R. P. , Construction Management.
2. Punmia, B. C., PERT and CPM.
3. Shrestha, S.K.; Adhikari, I. A text book of Project Engineering, Chandeswori Publication.
4. Dutta, B. N., Estimating and Costing.

Minor Project: Survey Camp EG 3107 CE

Year: III
Semester: I

Total: 4 hours /week
Lecture: hours/week
Tutorial: hour/week
Practical: 4 hours/week
Lab: hours/week

Course description:

This course is designed to equip students with hands on practice on field survey of different survey techniques. The duration of this programme will be not less than 7 days (60 hours).

Objectives:

After completion of this course students will be able to:

1. Provide an ample opportunity to consolidate and update their practical and theoretical knowledge in surveying, with facing actual field conditions and problems and
2. Provide real field based exposure to learn and apply different surveying methods, modern surveying instruments, computational practices, and ways of presentation of their final reports including plotting.

Course Contents:

1) Horizontal and Vertical Control Practices for Topographic Surveying: [4 Days]

Instrument for Horizontal Control: Theodolite and Total Station

Instrument for Vertical control: Auto level

Detailing by: Theodolite and Total Station

Conduct horizontal control practices around 2 hectares of land (about 8 control points) with semi built up area. Traverse must be enclosed and detailed topographic survey must be conducted within the periphery of that area. Coordinates (XYZ) of these traverses including details must be controlled by using theodolite, total station and auto level. Link traverse exercise can be done if necessary.

Horizontal Control: 1 set horizontal angles

Allowable difference between FL and FR observations = $180^{\circ} \pm 2 * \text{Least Count}$

Angular Accuracy = $1.5' \sqrt{n}$

Linear accuracy: 1:1000

Plotting scale: 1:500

Vertical control for control points must be done by fly leveling using auto level and detailing can be done by using total station or by theodolite.

Leveling misclosure: $25\sqrt{K}$ mm, where K = Circuit distance in Km

- 2) **Bridge Site Survey:** **[1.5 days]**
 Conduct triangulation survey for horizontal control. Conduct detailed topographic survey of bridge site area (125m *90m) to produce topographic map, L- section, X section etc.
Plotting scale:
Topographic Map: 1:200 or 1:500
L section: H- scale: 1:1000, V- scale 1:100
X section: H= V scale: 1:200
 No of triangulation stations not more than 6
 Coverage Area: Upstream 75m and downstream 50m from propose bridge axis& side width 30 m on either side of river bank.
Allowable angular accuracy = $\pm 1.5'\sqrt{n}$
One set horizontal angle observations with FL and FR difference of $180^\circ \pm 2 * \text{Least Count}$
Conduct reciprocal leveling and fly leveling for vertical control.
Allowable accuracy = $\pm 25\sqrt{K}$ mm

- 3) **Road Alignment Survey:** **[1.5 Days]**
 Perform at least **300m** road alignment survey and plot plan, L section, X section etc at standard scale.
 Establish BC, MC and EC while setting out of horizontal curves, and compute chainages.
 L sectioning data must be taken by auto level at 15m regular interval with plus stations if necessary.
 X sectioning data must be taken up to 10m left and 10m right from centre line.
- Plotting scale:**
Plan: 1:500
L- sectioning: H scale: 1:1000, V scale: 1:100
X sectioning: H and V scale: 1:200

Requirements:

As far as possible, no of students for each group should not be more than 5 (five).

Evaluation Scheme:

Internal Assessment:

Continuous assessment throughout the 7 days as well as viva for computation and plotting of traverse, viva for road and bridge site survey should be taken. The weightage of internal assessment will be 60% (60 marks).

Final Assessment:

Each group must submit survey camp report in standard format. During compilation of report, data must be submitted content wise including reference sketches and standard drawings must be compiled in A3 size. Original data and drawings must be presented during final viva voce. The weightage of final assessment will be 40% (40 marks).

Sixth Semester

Subjects:

- 1 EG 3201 MG Entrepreneurship Development
- 2 EG 3202 CE Highway Engineering II
- 3 EG 3203 CE Estimating and Costing III
- 4 EG 3204 CE Irrigation and Drainage Engineering
- 5 EG 3205 CE Major Project
- 6 EG 3206 CE Elective (One of the followings)
 - A: Trail Bridge
 - B: Hill Road
 - C: Hill Irrigation Engineering
 - D: Gravity Flow Water Supply System
 - E: Rural/Agriculture Road

Entrepreneurship Development

EG 3201 MG

Year: III
Semester: II

Total: 5 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 2 hours/week
Lab: hours/week

Course description:

This course is designed to provide the knowledge and skills on formulating business plan and managing small business. The entire course deals with assessing, acquiring, and developing entrepreneurial attitude; skills and tools that are necessary to start and run a small enterprise.

Course objectives:

After completion of this course students will be able to:

1. 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 and
5. Manage small business.

Course Contents:

Theory

- | | |
|--|-------------------|
| Unit 1: Introduction to Business & Entrepreneurship: | [9 Hours] |
| <ol style="list-style-type: none">1. Overview of entrepreneur and entrepreneurship2. Wage employment , self- employment and business3. Synopsis of types and forms of enterprises4. Attitudes, characteristics & skills required to be an entrepreneur5. Myths about entrepreneurs6. Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal | |
| Unit 2: Exploring and Developing Entrepreneurial Competencies: | [10 Hours] |
| <ol style="list-style-type: none">1. Assessing individual entrepreneurial inclination2. Assessment of decision making attitudes3. Risk taking behavior and risk minimization4. Creativity and innovation in business5. Enterprise management competencies | |
| Unit 3: Business identification and Selection: | [4 Hours] |
| <ol style="list-style-type: none">1. Sources and method of finding business idea(s)2. Selection of viable business ideas3. Legal provisions for MSMEs in Nepal | |

Unit 4: Business plan Formulation:

[17 Hours]

1. Needs and importance of business plan
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
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. Organizational and human resource plan
 - Legal status of business
 - Management structure
 - Required human resource and cost
 - Roles and responsibility of staff
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
6. Business plan appraisal
 - Return on investment
 - Breakeven analysis
 - Risk factors

Unit 5: Small Business Management:

[5 Hours]

1. Concept of small business management
2. Market and marketing mix
3. Basic account keeping

Practical

- Unit 1: Overview of Business & Entrepreneurship** [2 Hours]
1. Collect business information through interaction with successful entrepreneur
- Unit 2: Exploring and Developing Entrepreneurial Competencies** [2 Hours]
1. Generate innovative business ideas
- Unit 3: Product or service Identification and Selection** [2 Hours]
1. Analyze business ideas using SWOT method
- Unit 4: Business Plan Formulation** [22 Hours]
1. Prepare marketing plan
2. Prepare operation plan
3. Prepare organizational and human resource plan
4. Prepare financial plan
5. Appraise business plan
6. Prepare action plan for business startup
- Unit 5: Small Business Management** [2 Hours]
1. Prepare receipt and payment account
2. Perform costing and pricing of product and service

पाठ्यपुस्तक :

- क) प्रशिक्षकहरूका लागि निर्मित निर्देशिका तथा प्रशिक्षण सामग्री, प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद्, २०६९।
ख) प्रशिक्षार्थीहरूका लागि निर्मित पाठ्यसामग्री तथा कार्यपुस्तिका, प्राविधिक शिक्षा तथा व्यावसायिक तालीम परिषद् (अप्रकाशित), २०६९।

References:

1. Entrepreneur's Handbook, Technonet Asia, 1981.

Highway Engineering II

EG 3202 CE

Year: III
Semester: II

Total: 5 hours /week
Lecture: 3 hours/week
Tutorial: 1 hour/week
Practical: hours/week
Lab:2/2 hours/week

Course description:

This course is the continuation of Highway Engineering providing general background knowledge of road pavement, hill roads, road machineries, road construction technology and road maintenance.

Course objectives:

After completion of this course students will be able to:

1. Differentiate between road pavement structures;
2. Provide concept of hill road focusing on difference aspect to be considered in design;
3. Know the different types of equipments used in road construction along with the road construction methodology depending upon the type of road surface and
4. Be familiar with different types of failures that may occur in road pavement after its operation and probable causes of failure.

Course Contents:

Theory

Unit 1: Road Pavement: [2 Hours]

- 1.1 Definition, types, difference between flexible and rigid pavement
- 1.2 Different layers in pavement structure and their functions

Unit 2: Hill Roads: [7 Hours]

- 2.1 Definition, importance of hill roads in Nepal
- 2.2 Design and construction problems in hill roads
- 2.3 Special consideration of hill road geometric design
- 2.4 Typical cross sections of hill roads
- 2.5 Special structures in hill roads like retaining walls, revetment walls, tow wall, slope protection works

Unit 3: Road Machineries: [3 Hours]

- 3.1 Methods of road construction (labor based, machine based)
- 3.2 Different types of tools, equipment and plants
- 3.3 Different types of compacting equipment

- Unit 4: Road Construction Technology: [18 Hours]**
- 4.1 Introduction
 - 4.2 Activities involved in road construction
 - 4.2.1 Earthwork
 - 4.2.2 Drainage work
 - 4.2.3 Pavement work
 - 4.2.4 Protection works
 - 4.2.5 Miscellaneous works
 - 4.3 Earthwork
 - 4.3.1 Introduction
 - 4.3.2 Purpose
 - 4.3.3 Earthwork in embankment/excavation
 - 4.3.4 Relation of optimum moisture content and maximum dry density
 - 4.3.5 Field control of compaction and test required for field control
 - 4.4 Construction of earthen road: Introduction, materials required, equipment required, construction procedure
 - 4.5 Construction of gravel roads: Introduction, materials required, equipment required, construction procedure
 - 4.6 Construction of soil stabilized roads: Introduction to soil stabilization, types of soil stabilization, mechanical stabilization of soil (materials, equipment, construction procedure)
 - 4.7 Constructions of Water Bound Macadam (WBM) roads: Introduction, materials required, equipment required, construction procedure
 - 4.8 Construction of bituminous roads: Introduction, types of bituminous surfacing, interface treatment (prime coat, tack coat), seal coat, functions of each coat
 - 4.9 Surface dressing: types (single, double), materials required, equipment required, construction procedure
 - 4.10 Grouted macadam: types (full, semi), materials required, equipment required, construction procedure
- Unit 5: Highway Maintenance and Repair: [9 Hours]**
- 5.1 Introduction
 - 5.2 Types of maintenance activities
 - 5.3 Maintenance of earth roads, gravel roads, WBM roads
 - 5.4 Maintenance of bituminous roads (pot hole, patch repair works, crack sealing, edge repairing, resurfacing)
 - 5.5 Maintenance of drainage structures
 - 5.6 Maintenance of miscellaneous road structures (shoulder, slope, retaining structures, road furniture)
- Unit 6: Bridge: [6 Hours]**
- 6.1 Introduction
 - 6.1.1 Definition

- 6.1.2 Classification based on span, length, loading, materials and structures
- 6.2 T beam bridge
 - 6.2.1 Essential elements
 - 6.2.2 Detail of superstructure and substructure
- 6.3 Suspension bridge
 - 6.3.1 Introduction
 - 6.3.2 Components and their function

Practical (laboratory)

[15 Hours]

1. Perform California bearing test of soil
2. Perform Los Angeles Abrasion test of aggregate
3. Perform penetration test of bitumen
4. Perform softening point test of bitumen
5. Perform ductility test of bitumen

References:

1. Dinesh Kumar Shrestha, Anil Marsani, Transportation Engineering volume 1, Jasni Publications, Mid Baneshwor, Kathmandu, Nepal (2013).
2. Partha Mani Parajuli, Course Manual on Transportation Engineering I, IoE, Pulchowk, Lalitpur, Nepal.
3. C E G Justo, S K Khanna, Highway Engineering, Khanna Publications, New Delhi, India.
4. S. K. Sharma, Principles, Practice and Design of Highway Engineering, S Chand and Company Ltd. New Delhi, 1985.
5. A training manual on trail bridges, RTU, Department of Civil Engineering, Institute of Engineering.

Estimating and Costing III

EG 3203 CE

Year: III
Semester: II

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: hours/week

Course description:

This course focuses on familiarization of estimating and costing. It also deals with the specifications of sanitary, water supply and irrigation works.

Course objectives:

After completion of this course students will be able to:

1. Understand the procedures methods of measuring and quantity of irrigation, water supply and sanitary suspension bridges and culvert and RCC T beam decking works;
2. Analyze rates for irrigation and suspension bridge works;
3. Provide the basic knowledge of specification for water supply and sanitary and irrigation works and
4. Prepare the estimating the cost of irrigation, culvert water supply and sanitary works.

Course Contents:

Theory

Unit 1: Method of Estimating:

[15 Hours]

- 1.1. Water supply and sanitary works
- 1.2. Irrigation works
- 1.3. Culvert and RCC T- beam decking
- 1.4. Suspension bridge

Unit 2: Analysis of Rate for Irrigation and Suspension Bridges:

[15 Hours]

- 2.1 Factors affecting the cost of irrigation and suspension bridge works
- 2.2 Government procedure of preparing analysis or rate for irrigation and suspension bridges

Unit 3: Specifications:

[15 Hours]

- 3.1. Detailed specifications for water supply, sanitary and irrigation works:
 - 3.1.1. WC commode cistern
 - 3.1.2. WC pan with cistern
 - 3.1.3. Wash basin
 - 3.1.4. Supplying and laying G.I Pipe and fittings, PPR pipe
 - 3.1.5. Supplying and fixing winds with cistern
 - 3.1.6. Supplying and laying HDP pipe and fittings
 - 3.1.7. Supplying and laying PVC pipe and fittings
 - 3.1.8. Canal lining
 - 3.1.9. Hume pipe

Practical

[45 Hours]

Taking out detailed quantities and preparing estimate for the following:

1. Estimate internal plumbing and water supply work
2. Estimate service connection between street and consumer's pipe
3. Estimate tube well and accessories
4. Estimate earthwork in channel/canal
5. Estimate canal lining
6. Estimate sewer line, manholes and surface drain
7. Estimate suspension/suspended bridge
8. Estimate slab culvert
9. Estimate RCC T-beam decking
10. Estimate rural water supply (Drawing prepared by the student in water supply)
11. Estimate aqueduct structure
12. Estimate canal fall structure
13. Estimate slow sand filter
14. Estimate rapid sand filter

References:

1. Amarjit Aggarwal "Estimating civil quantity surveying and valuation" katson publishing house, ludhiyana, 1985
2. G.S. Berdie "Test book of estimating and costing"
3. M. Chakraborti "Estimating, costing, specification and valuation in civil engineering"
4. B.N Dutta "Estimating and costing, specification and valuation"

Irrigation and Drainage Engineering

EG 3204 CE

Year: III
Semester: II

Total: 8 hours /week
Lecture: 4 hours/week
Tutorial: 2 hours/week
Practical: 2 hours/week
Lab: hour/week

Course description:

This course focuses the development and management of irrigation and drainage systems in general.

Course objectives:

After completion of this course students will be able to:

1. Estimate irrigation water requirements;
2. Measure stream flow discharge;
3. Estimate monthly flows at intake;
4. Design canals based on soil type;
5. Identify suitable irrigation methods based on topography, crop and water source and
6. Explain the function, operation and maintenance of irrigation structures.

1. Introduction: [4 Hours]

1. Need and objectives of irrigation
2. Advantages and disadvantages of irrigation
3. Sources of irrigation water and types of irrigation system
4. History and future scope of irrigation in Nepal

2. Crop Water and Irrigation Water Requirements: [8 Hours]

1. Types and season of crops
2. Base and crop periods
3. Duty, Delta and their relation
4. Commanded areas (gross, net and irrigable)
5. Soil moisture contents and irrigation interval
6. Water requirement of different crops
7. Irrigation water requirement considering losses, land preparation and effective rainfall

3. Water Availability for Irrigation: [8 Hours]

1. Occurrence and distribution of rainfall in Nepal (Surface and ground waters)
2. Catchment area and runoff generation (factors affecting runoff)
3. Rain gauges and stream gauges (Gauge types and data presentation)
4. Stream flow measurement by velocity area method (Floats and Current meters)
5. Long term monthly flows at gauged and un-gauged locations

- 4. Methods of Irrigation:** [6 Hours]
1. Surface irrigation (Free flooding, Border strip, Check, Basin and Zigzag methods)
 2. Subsurface irrigation
 3. Sprinkler irrigation
 4. Drip or Trickle irrigation
- 5. Diversion Head Works:** [8 Hours]
1. Layout, components and their functions
 2. Weir and Barrage systems
 3. Silt control by under sluices at head works (still pond regulation and continuous flushing)
 4. Silt excluder and sediment ejector
 5. Head regulator
- 6. Canal Irrigation:** [10 Hours]
1. Components of canal system
 2. Alignment of canals
 3. Design of alluvial canals (Lacey's and Kennedy's theories)
 4. Design of non-alluvial canals (Manning's and Chezy's Formulae)
 5. Seepage of canals and lining
 6. Canal standards
- 7. Irrigation Structures:** [8 Hours]
1. Cross-drainages
 2. Drops or Falls
 3. Head and Cross regulators
 4. Escapes
 5. Outlets
- 8. Water Logging and Drainage:** [5 Hours]
1. Causes, effects and preventive measures of water logging
 2. Need and importance of drainage
 3. Surface and subsurface drainage systems
- 9. Irrigation Management:** [3 Hours]
1. Operation and maintenance of irrigation works
 2. Institutional development of irrigation systems
- Tutorials:** [30 Hours]
1. Duty-Delta relation
 2. Soil moisture contents and irrigation interval
 3. Estimation of canal design discharge
 4. Design of canals based on theory of Lacey, Kennedy, Chezy and Manning
 5. Estimation of long term monthly flows in river at intake

Practical

[30 Hours]

1. Measure flow by velocity area method
2. Estimate irrigation water requirement by CROPWAT software

References:

1. Irrigation Engineering and Hydraulic Structures, S K Garg, Delhi, 1983
2. Irrigation Engineering, Gurcharan Singh
3. Fundamentals of Irrigation Engineering, Bharat Singh, Nem Chand and Bros, Roorkee, 1983
4. Theory and design of irrigation structures, volume I and II, R S Varshney, S C Gupta and R L Gupta, Nem Chand and Bros., Roorkee, 1979

Major Project Work

EG 3205 CE

Year: III
Semester: II

Total: 10 hours /week
Lecture: hour/week
Tutorial: hour/week
Practical: 10 hours/week
Lab: hour/week

Course description:

This course is designed to make students aware of using theoretical and practical application in integrated manner to their knowledge gained during whole course related to civil engineering. Topics will normally contain measurement, design, drawing, cost estimate of components. Reading assignments and lecture on report design and oral presentations techniques will be in beginning of session. Preparation of the report and an oral seminar will occur at the end of the session.

Course objectives:

After completion of this course students will be able to:

1. Prepare design, drawing and cost estimate of residential/small office building projects;
2. Prepare design, drawing and cost estimate of small rural water supply projects and sanitary works and
3. Prepare drawings and cost estimate of small roads and irrigation projects.

The overall assignment will be as follows:

A. Building:	5.0 Hours/week
B. Sanitary and Water supply:	1.5 Hours/week
C. Highway:	1.5 Hours/week
D. Irrigation:	2.0 Hours/week

Each part of the subjects will be evaluated as a continuous process.

Course Contents:

Unit 1 Building:

[75 Hours]

- 1.1. Measure a plot of land for building layout.
- 1.2. Collect materials and labour rate for rate analysis.
- 1.3. Carryout architectural design and drawing of a 3 or 4 rooms and 2 to 4 storey residential/office building (site plan, floor plans, elevations, sections, flooring, roofing, staircase, finishes, fire place details).
- 1.4. Design/interpret structural components (foundation, wall, column, beams, ties, floors, and roof trusses) including seismic details drawings.
- 1.5. Prepare design and drawing of internal plumbing details (bathroom, hot and cold water supply system, waste water and rain water systems).

- 1.6. Rain water (rain water harvesting, ground water recharge) and ground water treatment details for domestic use.
- 1.7. Study drawing of electrical system (power, light layout) and telephone network system.
- 1.8. Rate analysis and detailed cost estimate.
 - Prepare drawings both manually and using CADD software.

Unit 2 Sanitary and Water Supply: [22 Hours]

- 2.1. Prepare/observe external drainage system, sewer pipe layout, septic tank, soak pit design and drawings.
- 2.2. Prepare design and drawings of a rural water supply scheme (gravity flow).
- 2.3. Prepare bill of quantities and cost estimate.

Unit 3 Highway: [23 Hours]

- 3.1. Study of contour map.
- 3.2. Draw layout of road alignment, profile, cross-section with the help of given data/topographic map.
- 3.3. Design horizontal and vertical curve.
- 3.4. Provide typical retaining structures, drains and culverts.
- 3.5. Prepare bill of quantities and cost estimate.

Unit 4 Irrigation: [30 Hours]

- 4.1. Draw layout, profile and cross-section of small hill irrigation project with the help of given data/topographic map.
- 4.2. Draw typical head works structure (weir, trash-rack), aqueduct, fall, Siphon, lined canal sections etc.
- 4.3. Prepare bill of quantities and cost estimate.

Evaluation Scheme:

S. No.	Subjects/Topics	Marks distribution %	Internal %	Final %
1	Building	50	30	20
2	Sanitary and Water Supply	15	9	6
3	Highway	15	9	6
4	Irrigation	20	8	12
Total		100	60	40

References:

1. Course notes provided by the teachers/department.
2. Sample drawings of different municipality office, Nepal Government Projects.
3. Building bye-laws.
4. Building Construction Hand Book by Roy Chudley and Roger Greeno.
5. Nepal National Building Codes.
6. Village water systems- A technical journal (Nepal and Bhutan)
7. Estimating and Costing by B. N. Dutta.
8. Text books of related courses.
9. Government norms of rate analysis.

Trail Bridge

EG 3206 CE

Year: III
Semester: II

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: hour/week

Course description:

Course focuses on the design and construction of Trail Bridge. It includes survey works, fundamental of design works, and calculation of quantity and cost estimate and construction of Trail Bridge

Course objectives:

After completion of this course students will be able to:

1. Identify components of trail bridge;
2. Perform design of a trail bridge;
3. Prepare standard drawings and quantity estimate;
4. Construct/supervise a trail bridge and
5. Explain trail bridge maintenance and site investigation works.

Course Contents:

Theory

Unit 1:	Introduction:	[2 Hours]
	1.1 Trail bridge in Nepal	
	1.2 Classification of trail bridges and their components	
Unit 2:	Survey and Bridge Site Selection:	[7 Hours]
	2.1 Collection of essential data	
	2.2 Socio-economic survey	
	2.3 Topographic study and engineering survey	
	2.4 Bridge site selection	
Unit 3:	Design of Trail Bridge:	[18 Hours]
	3.1 Basic design concept and design procedure	
	3.2 Cable	
	3.2.1 Introduction to cable and its specification	
	3.2.2 Cable geometry and its analytical presentation	
	3.2.3 Cable design	
	3.3 Standard tower selection	
	3.4 Design of tower foundation and cable anchorage	
	3.5 Design of walkway, suspenders/hangers	

Unit 4:	Bridge Standard Drawings:	[4 Hours]
	4.1 Construction drawing	
	4.2 Steel drawing	
Unit 5:	Estimating and Costing:	[3 Hours]
	5.1. Estimate of different bridge components	
	5.2. Costing of different bridge components	
Unit 6:	Construction of Trail Bridge:	[9 Hours]
	6.1 Construction planning	
	6.2 Setting out of the bridge	
	6.3 Excavation works, cement works	
	6.4 Transportation, handling and hoisting of cable	
	6.5 Fabrication / erection / construction of bridge	
Unit 7:	Bridge Maintenance:	[2 Hours]
	7.1. Introduction	
	7.2. Classification	
	7.3. Bridge condition investigation	

Practical

1. Identify components of suspension trail bridge	[3 Hours]
2. Identify components of suspended trail bridge	[3 Hours]
3. Perform bridge site selection	[3 Hours]
4. Layout bridge axis and bridge components	[9 Hours]
5. Design trail bridge components	[9 Hours]
6. Prepare drawings trail bridge components	[9 Hours]
7. Perform quantity calculation and cost of trail bridge components	[9 Hours]

References:

1. **Survey, Design and Construction of Trail Suspension Bridges for Remote Areas**
Volume A: **Design**, F. Grob, J. Krähenbühl, A. Wagner.
Volume B: **Survey**, J. Krähenbühl, A. Wagner.
Volume C: **Standard Design Drawings**, C. B. Basnet, J. Krähenbühl.
Volume D: **Execution of Construction Works**, D. Panciotto.
Volume E: **Costing and Contracting**, J. Krähenbühl.
2. **Trail Suspension Bridges** (Course Manual), SBD,DOR & IOE.
3. **Short-span Trail Bridge Standard**, Technical Handbook, Trail Bridge Section, GoN.

Hill Road

EG 3206 CE

Year: III
Semester: II

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: hours/week

Course description:

This course is aimed at providing general background knowledge of hill roads regarding route location process, geometric design, hairpin bends, and hill roads drainage.

Course objectives:

After completion of this course students will be able to:

1. Understand the concept of hill road alignment; consideration of different factors in choosing the alignments;
2. Understand the principles of hill road geometric design, both vertical and horizontal together with drainage component of hill road;
3. Know the construction methodology to be adopted in hill road along with pavement type and its maintenance and
4. Sensitize special road side facilities to be provided in hill road and its safety implications and impact on environment.

Course Contents:

Theory

Unit 1: Introduction to Hill Roads:

[3 Hours]

- 1.1 Definition and importance of hill roads in Nepal
- 1.2 Design and construction problems in hill roads
- 1.3 Special consideration of hill road geometric design

Unit 2: Hill Road Alignment:

[5 Hours]

- 2.1. Introduction
- 2.2. Factors affecting hill road alignment
 - 2.2.1. Temperature
 - 2.2.2. Rainfall
 - 2.2.3. Atmospheric pressure
 - 2.2.4. Geological conditions
- 2.3. Survey methods
- 2.4. Hill road route location process

Unit 3: Geometric Design of Hill Roads:

[12 Hours]

- 3.1. Introduction
- 3.2. Design speed
- 3.3. Design of cross sectional elements
 - 3.3.1. Road width
 - 3.3.2. Camber
 - 3.3.3. Super elevation
 - 3.3.4. Lateral and vertical clearance
- 3.4. Horizontal alignment
 - 3.4.1. Superelevation
 - 3.4.2. Extrawidening
 - 3.4.3. Setback
- 3.5. Hair pin bends (symmetrical/unsymmetrical)
- 3.6. Sight distance
- 3.7. Gradient
- 3.8. Vertical curves
- 3.9. Typical cross sections of hill roads

Unit 4: Formation Works:

[4 Hours]

- 4.1. Trace cut
- 4.2. Jungle clearance
- 4.3. Earthwork in excavation
- 4.4. Rock cutting, drilling, blasting, clearing
- 4.5. Earthwork in embankment
- 4.6. Tools required for manual method of road construction
- 4.7. Plants and equipment required for mechanized method of road construction

Unit 5: Pavement and Maintenance:

[5 Hours]

- 5.1. Types of pavement
- 5.2. Factors governing pavement design
- 5.3. Pavement design methods
- 5.4. Introduction and necessity of maintenance
- 5.5. Component of maintenance activities

Unit 6: Drainage and Cross Drainage:

[5 Hours]

- 6.1. Introduction
- 6.2. Hydrological study (empirical formula for runoff calculation)
- 6.3. Design of side drains
- 6.4. Intercepting catch water drains, chutes, cross drains, ford, causeways, subsurface drainage

Unit 7: Special Structures in Hill Roads:**[4 Hours]**

- 7.1. Slope protection structures
- 7.2. Classification of retaining walls (based on materials, structural scheme, location)
- 7.3. Parapet, railing and edge stones
- 7.4. River training structures

Unit 8: Road side Facilities, Safety and Environment:**[7 Hours]**

- 8.1. Introduction and importance of road side facilities
- 8.2. Types of road side facilities
- 8.3. Introduction to hill road safety
- 8.4. Introduction
- 8.5. Causes of accidents
- 8.6. Safety measures (engineering, enforcement, education)
- 8.7. Introduction to environment
- 8.8. Impact of highway projects on environment
- 8.9. Mitigation measures of adverse environmental impacts

Practical**[45 Hours]**

1. Perform design and drafting of hair pin bends (both symmetrical and unsymmetrical)
2. Perform drafting of hill road typical cross sections (cut and fill, benching, embankment with retaining walls, semi tunnel, semi bridge, platform)
3. Perform drafting of drainage facilities: Low level causeway, High level causeway, Pipe culvert, Slab culvert (Plan, Profile and Cross section)
4. Perform drafting of typical gravity retaining wall, gabion retaining wall (Cross section)

References:

1. Dinesh Kumar Shrestha, Anil Marsani, Transportation Engineering volume 1, Jasni Publications, Mid Baneshwor, Kathmandu, Nepal, 2009.
2. Partha Mani Parajuli, Course Manual on Transportation Engineering I, IoE, Pulchowk, Lalitpur, Nepal.
3. C E G Justo, S K Khanna, Highway Engineering, Khanna Publications, New Delhi, India.
4. S. K. Sharma, Principles, Practice and Design of Highway Engineering, S Chand and Company Ltd. New Delhi, 1985.
5. Hill Road Manual, IRC SP 48: 1988, Indian Road Congress, New Delhi, India.

Hill Irrigation Engineering

EG 3206 CE

Year: III
Semester: II

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: 3 hours/week

Course description:

This course focuses on development and management of small canal irrigation and micro irrigation schemes in the hills of Nepal.

Course objectives:

After completion of this course students will be able to:

1. Understand importance and scope of irrigation in the hills of Nepal;
2. Align safe and cost effective canals in hilly areas;
3. Estimate monthly flows at intake;
4. Design canals based on soil type;
5. Know the specific irrigation structures suitable for hills;
6. Use sprinkler and drip irrigation methods in remote hills and
7. Operate and maintain hill irrigation systems.

Course Contents:

Theory

- Unit 1: Introduction:** [5 Hours]
1.1 Physiographic regions and farming systems of Nepal
1.2 Characteristics of hill irrigation systems
1.3 Need, potentiality and types of irrigation development in the hills of Nepal
- Unit 2: Environmental Aspects of Hill Irrigation:** [5 Hours]
2.1 Problems of floods, soil erosion and land slides
2.2 Mountain zone classification
2.3 Engineering and vegetative measures for hilly canals in different mountain zones
- Unit 3: Planning and Implementation of Hill Irrigation:** [4 Hours]
3.1 Long term planning with farmer's participation
3.2 Request proposal for project assistance and screening
3.3 Stages of project study and data collection
- Unit 4: Water Availability and Irrigation Requirements:** [8 Hours]
4.1 Flow assessment techniques based on data availability (MIP, WECS & HSC)

- 4.2 Extractable flow for irrigation
- 4.3 Consumptive use of selected cropping pattern
- 4.4 Operational water requirements
- 4.6 Percolation losses and irrigation efficiencies
- 4.7 Computation of irrigation water requirements

Unit 5: Canal Irrigation in Hills: **[10 Hours]**

- 5.1 Canal intakes for hill irrigation: Suitable intakes and their locations; Design factors of bank intakes; Single orifice and bottom rack intakes
- 5.2 Sediment control for hill canals: Natural and artificial methods; Sediment control structures for hill canals; Gravel trap and settling basin
- 5.3 Canals and Distribution Systems for Hill Irrigation: Nomenclature, layout and alignment of hill canals; Seepage and lining of hill canals; Characteristics of distribution systems and Layout pattern appropriate to hill irrigation; Structural components of the distribution system; Flow division structures and Operation of Saacho
- 5.4 Escapes and Drop structures for Hill Canals: Need of escapes in hills; Suitable escapes for hills; Location of escapes in hills; Suitable drops in hills
- 5.5 Cross Drainage Structures for Hill Canals: Selection of suitable C/D structures in hills; Aqueducts, their advantages and disadvantages; Problems of aqueducts and prevention; Super passages, their advantages and disadvantages; Problems of super passages and prevention; Siphons and their disadvantages; Problems of siphons and prevention; Level crossings, their advantages and disadvantages; Inlets and Outlets

Unit 6: Sprinkler Irrigation: **[5 Hours]**

- 6.1 Advantages and suitability of sprinkler for hill irrigation
- 6.2 Limitations and disadvantages of sprinkler irrigation
- 6.3 Types and components of sprinkler system
- 6.4 Design approach and selection of sprinklers

Unit 7: Drip or Trickle Irrigation: **[5 Hours]**

- 7.1 Advantages and suitability of drip for hill irrigation
- 7.2 Limitations and disadvantages of drip irrigation
- 7.3 Types and components of drip system
- 7.4 Design approach and selection of drips

Unit 8: Gabion Structures for Remote Hill Areas: **[3 Hours]**

- 8.1 Advantages of gabion construction
- 8.2 Design considerations for gabion structures
- 8.3 Characteristics of fill material

Practical

[45 Hours]

1. Demonstration of sprinkler and drip irrigation
2. Assignment on estimation of monthly flows and floods at canal intake

References:

1. Hill Irrigation Engineering, Institute of Engineering, TU, Pulchowk Campus, Pulchowk, Lalitpur.
2. Design Manuals for Irrigation Projects in Nepal, M.1 to M.13, Sir M MacDonald & Partners Ltd, PDSP, UNDP, World Bank, DOI, February 1990.
3. Simple Design of Hill Irrigation, P C Pokharel

Gravity Flow Water Supply System

EG 3206 CE

Year: III
Semester: II

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: hours/week

Course description:

This course is designed to provide the concepts and principles, and functions of the various components of gravity flow water supply system, water sources and their selection, determination of water demand, intake construction, design and construction of water mains and distribution systems. The practical work is expected to give students an in-depth knowledge of the gravity flow water supply systems.

Course objectives:

After completion of this course students will be able to:

1. Explain the various types of gravity flow water supply system;
2. Describe the components of gravity flow water supply system;
3. Estimate the yield of various water sources;
4. Make selection of appropriate sources and
5. Carry out the feasibility survey for gravity water supply system.

Course Contents:

Theory

Unit 1. Introduction:

[4 Hours]

- 1.1 Definition of gravity flow water supply system
- 1.2 Types of gravity flow water supply system
 - 1.2.1 Closed systems
 - 1.2.2 Open systems
 - 1.2.3 Intermittent systems
 - 1.2.4 Combination system
- 1.3 Main components and their function
 - 1.3.1 Intake
 - 1.3.2 Collection Chamber
 - 1.3.3 Interruption Chamber and Break Pressure Tank
 - 1.3.4 Distribution Chamber
 - 1.3.5 Reservoir Tank (RVT)
 - 1.3.6 Sedimentation Tanks
 - 1.3.7 Pipeline
 - 1.3.8 Other appurtenances

Unit 2. Engineering Survey: [6 Hours]

- 2.1 Types of survey (Feasibility and Detailed)
- 2.2 Source Measurement
 - 2.2.1 Wrist watch-Bucket method
 - 2.2.2 Weir (V-Notch) method
 - 2.2.3 Velocity Area method
- 2.3 Safe Yield
- 2.4 Topographical survey
- 2.5 Population Survey
- 2.6 Determination of material, transportation and labor availability and rates

Unit 3. Design Period, Per Capita Water Demand and Total Water Requirement: [4 Hours]

- 3.1 Design Period
- 3.2 Annual population growth rate
- 3.3 Water Demand
 - 3.3.1 Per capita demand
 - 3.3.2 Domestic demand
 - 3.3.3 Non-domestic Demand
 - 3.3.4 Total system Daily Demand
 - 3.3.5 Continuous Demand Flow
- 3.4 Peak period/Peak factor
- 3.5 Tap stand Flow Rates

Unit 4. Pipeline Design: [12 Hours]

- 4.1 Hydraulics Background
 - 4.1.1 Water Pressure
 - 4.1.2 Frictional Losses
 - 4.1.3 Minor Losses
- 4.2 Pressure limits of pipes
- 4.3 Pipe Diameter
- 4.4 Velocity Limits
- 4.5 Plotting of Ground Profile
- 4.6 Hydraulic Calculations
 - 4.6.1 Determination of the available frictional percent
 - 4.6.2 Selection of Pipe Size
 - 4.6.3 Hydraulic Calculation Form
 - 4.6.4 Plotting the HGL
- 4.7 Design Example

Unit 5. Pipeline Construction: [5 Hours]

- 5.1 Organizing Material and Labor
- 5.2 Laying of Pipeline
 - 5.2.1 Excavating Trenches
 - 5.2.2 Bedding Trenches

- 5.2.3 Pipe Joining
- 5.2.4 Thrust Blocking
- 5.2.5 Backfilling Trenches
- 5.3 Break-Pressure Tank Construction

Unit 6. Intake Structures: **[4 Hours]**

- 6.1 Definition and Types
- 6.2 Site selection
- 6.3 Spring Intakes
 - 6.3.1 Excavation of gravity fed springs
 - 6.3.2 Spring Catchment Structures
 - 6.3.3 Collection Chamber and Valve Box
- 6.4 Stream Intakes
 - 6.4.1 Site Selection
 - 6.4.2 Excavation
 - 6.4.3 Catchment Dam
 - 6.4.4 Spillway
 - 6.4.5 Valve Box, Collection Chamber and Fittings

Unit 7. Reservoir Tank (RVT): **[4 Hours]**

- 7.1 Reservoir Tank Sizing
- 7.2 Reservoir Tank Layout Options
- 7.3 Location of Reservoir Tank
- 7.4 Structural Considerations/Material Requirements

Unit 8. Tap stand: **[4 Hours]**

- 8.1 Necessity
- 8.2 Location of Tap stands
- 8.3 Tap stand Flow Rate
 - 8.3.1 Open Systems
 - 8.3.2 Intermittent Systems
 - 8.3.3 Multi-RVT Systems
- 8.4 Construction Tips
- 8.5 Fittings, Material and Labor Requirements

Unit 9. Sustainability of the System: **[2 Hours]**

- 9.1 Sanitation and health education
- 9.2 User committee empowerment
- 9.3 Operation and maintenance
- 9.4 Continued training

Practical (with drawings) [45 Hours]

1. Estimate design population and design discharge
2. Determine reservoir tank sizing
3. Compute tap stand flow rate
4. Compute pipe size
5. Observe rural water supply scheme and write a brief report and submit to concerned teacher

References:

1. Rural Gravity Flow Water Systems (Design Techniques and Standard Structures), UNICEF, Nepal, 1996.
2. Jordan, T. J., Handbook of Gravity Flow Water Systems, UNICEF, 1990.
3. Guidelines for Gravity Water Supply System (Survey, Design and Estimate), Rural Water Supply and Sanitation Fund Development Board (RWSSFDB).

Rural/Agricultural Road

EG 3206 CE

Year: III
Semester: II

Total: 6 hours /week
Lecture: 3 hours/week
Tutorial: hour/week
Practical: 3 hours/week
Lab: hours/week

Course description:

This course is aimed at providing general background knowledge of rural/agricultural roads regarding route location process, geometric design, drainage facilities and quality construction during construction.

Course objectives:

After completion of this course students will be able to:

1. Understand the concept of rural/agricultural road alignments;
2. Be familiar with the survey procedure;
3. Understand the principles of geometric design, both vertical and horizontal together with drainage component of rural/agricultural road and
4. Differentiate between the different types of pavement used in rural road construction along with their construction methodology and maintenance.

Course Contents:

Theory

Unit 1. Introduction of Rural/Agricultural Road: [4 Hours]

- 1.1 Classification
- 1.2 Vehicle type and dimension
- 1.3 Terrain classification
- 1.4 Design speed
- 1.5 Design capacity

Unit 2. Route Selection and Surveying : [4 Hours]

- 2.1 Reconnaissance survey
- 2.2 Preliminary survey
- 2.3 Determination of final center line
- 2.4 Final location survey
- 2.5 Preparation and presentation of project document

Unit 3. Drainage and Retaining Structures: [6 Hours]

- 3.1 Introduction
- 3.2 Side drains
- 3.3 Catch water drains
- 3.4 Cross drainage structures
- 3.5 Retaining walls
- 3.6 Breast walls

Unit 4. Pavement: [4 Hours]

- 4.1 Pavement materials, properties and specification
- 4.2 Pavement thickness and composition

Unit 5. Road Design: [10 Hours]

- 5.1. Geometric design of rural/agricultural roads
- 5.2. Construction stages
- 5.3. Design standard
- 5.4. Critical design factors
- 5.5. Design specification for
 - 5.5.1. Horizontal alignment
 - 5.5.2. Super elevation
 - 5.5.3. Curve widening
 - 5.5.4. Transition curve
 - 5.5.5. Sight distance
 - 5.5.6. Intersection
 - 5.5.7. Vertical alignment

Unit 6. Construction Procedure and Quality Control: [8 Hours]

- 6.1 Introduction
- 6.2 Tools, plants and equipment required
- 6.3 Embankment
- 6.4 Granular sub-base
- 6.5 Mechanical stabilization
- 6.6 Water bound macadam
- 6.7 Bituminous works

Unit 7. Maintenance Strategy: [9 Hours]

- 7.1. Introduction
- 7.2. Maintenance of earth roads
- 7.3. Maintenance of gravel and stabilized roads
- 7.4. Maintenance of WBM roads
- 7.5. Maintenance of bituminous roads
- 7.6. Maintenance of bridges, structures and drains

Practical (45 Hours)

1. Perform drafting of drainage facilities: Low level causeway, High level causeway, Pipe culvert, Slab culvert (Plan, Profile and Cross section)
2. Perform drafting of typical gravity retaining wall, gabion retaining wall (Cross section)
3. Observe nearest rural/agricultural road, and write a brief report and submit to concerned teacher

References:

1. Technical guidelines for agricultural and rural roads, GoN, DoLIDAR, 1998.
2. Technical specification for agricultural and rural roads, GoN, DoLIDAR, 1998.
3. Rural road technical design manual, GoN, DoLIDAR.

Experts involved in Curriculum Development

CTEVT would like to extend its heartfelt thanks to the following experts who contributed in the process of developing the curriculum of **Diploma in Civil Engineering**.

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