

CURRICULUM

DIPLOMA

Geomatics Engineering

(Three Years Program- Semester System)



Council for Technical Education and Vocational Training

Curriculum Development Division

Sanothimi, Bhaktapur

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Introduction

The course was initiated as Diploma in Survey Engineering in 2000. With regard to various developments in this sector and also the field of application, the need of revision of this course has become prominent. Most of the international institutions and universities currently recognize this subject of study as Geomatics. Also, in view of the Kathmandu University initiative in this subject by starting the Bachelor's of Engineering in Geomatics Engineering in Nepal has prompted for change in the course title as ***Diploma in Geomatics Engineering***. The course is aimed at producing middle level technical human resource in the field of Geomatics.

This course is based on the job required to perform by a Geomatics technician at different related industries and organizations in Nepal and abroad. The Diploma in Geomatics Engineering program extends over three years. Each year is divided into two semesters. There are six semesters in total within the period of three years. It is designed to produce middle level competent Geomatics technicians equipped with knowledge and skills related to the land surveying, engineering/ construction surveying and Geographical Information System and applications. The study of Geomatics Engineering provides the ample opportunities of employment and self employment in the field of surveying, mapping and GIS.

This curriculum includes the basic science subjects like physics, chemistry, and mathematics applicable in the field of Geomatics Engineering. It also includes language subjects like Nepali and English applicable for the communication in the field of Geomatics technology. The course structure and the subject-wise contents that follow reflect the details of this curriculum. In short, this curriculum guides its implementers to produce competent and highly employable middle level technical human resources in the field of Geomatics Engineering.

The contents of individual subjects prescribed in the curriculum are incorporated in the light of "must to know and must to do" principle.

Curriculum Title:

Diploma in Geomatics Engineering

Aim

The program aims to produce middle level technical personnel with sound academic knowledge equipped with perfect technical skills that can be faced in real life situation.

Program Objectives

This curriculum has following objectives to:

- Produce surveyors/middle level competent technical workforces who could serve land survey works.
- Prepare the technicians who are capable for undertaking works in spatial data acquisition using field survey methods, processing and visual presentation.
- Interpret image data acquired through Air survey, GIS and remote sensing.
- Serve local level land planning, land resource management and natural resource planning works.
- Prepare technical workforce who will demonstrate positive attitude and respect for the profession and socio-cultural values.
- Help in meeting the demands of required Surveyors in the sector of land survey.
- Create self-employment opportunities.

Group Size

The group size will be maximum of 48 (forty eight) students in a batch.

Entry Criteria

- SLC Pass or SEE with minimum C grade in Compulsory Mathematics & Science and D+ in English.
- TSLC in Geomatics Engineering with minimum 66.68%.
- Should pass entrance examination as administered by CTEVT.

Duration

The total duration of this curricular program is three academic years. The program is based on semester system. Moreover, one semester year consists up to 16 weeks and one academic week consists up to 40 hours excluding evaluation period.

Medium of Instruction

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

Pattern of Attendance

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

Teachers and Students Ratio

The ratio between teachers and students must be:

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

Qualification of Teachers and Instructors

- The program coordinator should be a master's degree holder in the related area.
- The disciplinary subject related teacher and demonstrators should be a bachelor's degree holder in the related area.
- The foundational subject related teacher should be master degree holder in the related area.

Instructional Media and Materials

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

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

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, fieldwork, block study, industrial practice, report writing, term paper presentation, heuristic and other independent learning exercises.

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

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

Mode of Education

There will be inductive and deductive mode of education.

Examination and Marking Scheme

a. Internal assessment

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

b. Final examination

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

c. Requirement for final practical examination

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

d. Final practicum evaluation will be based on:

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

e. Pass marks:

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

Provision of Back Paper

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

Disciplinary and Ethical Requirements

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

Grading System

The following grading system will be adopted:

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

Certification and degree awards:

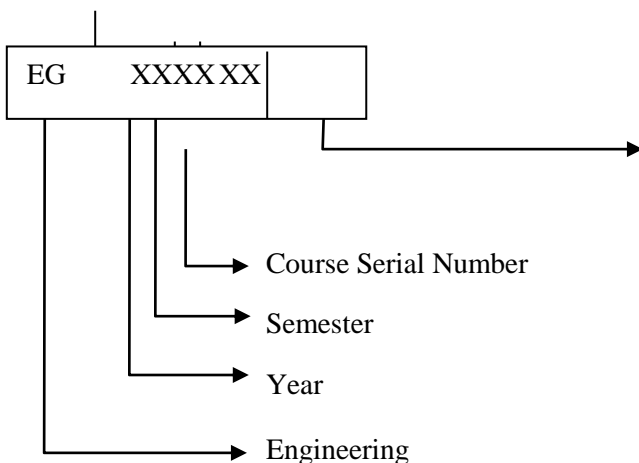
- Students who have passed all the components of all subjects of all 6 semester are considered to have successfully completed the program.
- Students who have successfully completed the program will be awarded with a degree of "**Diploma in Geomatics Engineering**".

Career Opportunity

The graduates will be eligible for the position equivalent to Non-gazette 1st class/Level 5 (technical) as prescribed by the Public Service Commission of Nepal and other related agencies. The graduate will be eligible for registration with the related health professional council in the grade as provisioned in the related Council Act (if any).

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
- GE: Geometric Engineering

Provision of elective subjects:

There will be no provision of elective subjects in this curricular programme.

Course Structure of Diploma in Geomatics Engineering

Year: I

Semester: I

Teaching Schedule			Mode					DISTRIBUTION OF MARKS						Total Marks	Remarks
S.N	Course Code	Course Title	L	T	P	Lab	Total Hours	Theory			Practical				
								Asst. Marks	Final Marks	Exam Hours	Asst. Marks	Final Marks	Exam 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	2	100	
5	EG 1105 SH	Engineering Chemistry I	3	1		2	6	20	60	3	10	10	2	100	
6	EG 1102 AR	Survey Drawing	1	-	8		9	0	0		120	80	4	200	
7	EG 1101 GE	Survey Instruments and Concepts	2	-	8		10	10	40	1.5	120	80	4	250	
Total			17	3	16	4	40	90	320		260	180		850	

Year: I

Semester: II

Teaching Schedule			Mode					DISTRIBUTION OF MARKS						Total Marks	Remarks
S.N	Course Code	Course Title	L	T	P	Lab	Total Hours	Theory			Practical				
								Asst. Marks	Final Marks	Time Hours	Asst. 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	2	100	
3	EG 1203 SH	Engineering Chemistry II	3	1		2	6	20	60	3	10	10	2	100	
4	EG 1204 SH	Communicative English II	2				2	10	40	1.5				50	
5	EG 1201 GE	Fundamentals of Surveying and Geomatics	6	-	6		12	20	80	3	60	40	3	200	
6	EG 1221 CT	Computer Application	2		8		10	10	40	1.5	120	80	4	250	
Total			19	3	14	4	40	100	360		200	140		800	

Year: II

Semester: III

Teaching Schedule			Mode				DISTRIBUTION OF MARKS						Total Marks	Remarks
S.N	Course Code	Course Title	L	T	P	Total Hours	Theory			Practical				
							Asst. Marks	Final Marks	Time Hours	Asst. Marks	Final Marks	Time Hours		
1	EG 2101 SH	Applied Mathematics	4	-		4	20	80	3				100	
2	EG 2101 GE	Fundamental of GIS	4	-	4	8	20	80	3	60	40	3	200	
3	EG 2102 GE	Control Survey	6		12	18	20	80	3	120	80	4	300	
4	EG 2103 GE	Cartography	4	-	2	6	20	80	3	30	20	3	150	
5	EG 2104 GE	CAD	-	-	4	4	-	-		60	40	3	100	
Total			18		22	40	80	320		270	180		850	

Year: II

Semester : IV

Teaching Schedule			Mode				DISTRIBUTION OF MARKS						Total Marks	Remarks
S.N	Course Code	Course Title	L	T	P	Total Hours	Theory			Practical				
							Asst. Marks	Final Marks	Time Hours	Asst. Marks	Final Marks	Time Hours		
1	EG 2201 GE	Fundamental of Social Science and Environment	4			4	20	80	3				100	
2	EG 2202 GE	Photogrammetry	4	-	4	8	20	80	3	60	40	3	200	
3	EG 2203 GE	Remote Sensing	4	-	4	8	20	80	3	60	40	3	200	
4	EG 2204 GE	Topographical Survey-	4	-	10	14	20	80	3	120	80	4	300	
5	EG 2211 CT	Basic Computer Programming	2	-	4	6	10	40	1.5	30	20	3	100	
Total			18		22	40	90	360		240	180		900	

Year: III**Semester: V**

Teaching Schedule			Mode				DISTRIBUTION OF MARKS						Total Marks	Remarks
S.N	Course Code	Course Title	L	T	P	Total Hours	Theory			Practical				
							Asst. Marks	Final Marks	Time Hours	Asst. Marks	Final Marks	Time Hours		
1	EG 3101 GE	Geodesy and Astronomy	4		2	6	20	80	3	30	20	3	150	
2	EG 3102 GE	Civil Construction and Quantity Survey	4		2	6	20	80	3	30	20	3	150	
3	EG 3103 GE	Cadastral Survey	6	-	10	16	20	80	3	120	80	4	300	
4	EG 3104 GE	Land Administration and Land Laws	4	-	2	6	20	80	3	30	20	3	150	
5	EG 3105 GE	Survey Project Management	4	-	2	6	20	80	3	30	20	3	150	
Total			22		18	40	80	320		210	140		900	

Year: III**Semester: VI**

Teaching Schedule			Mode				DISTRIBUTION OF MARKS						Total Marks	Remarks
S.N	Course Code	Course Title	L	T	P	Total Hours	Theory			Practical				
							Asst. Marks	Final Marks	Time Hours	Asst. Marks	Final Marks	Time Hours		
1	EG 3201 GE	Engineering Survey	4	-	8	12	20	80	3	120	80	4	300	
2	EG 3201 MG	Entrepreneurship Development	3	-	2	5	10	40	1.5	30	20	3	100	
3	EG 3202 GE	GIS Application	4	-	6	10	20	80	3	60	40	3	200	
4	EG 3203 GE	Project Work	-	-	13	13	-	-	-	120	80	4	200	
Total			11		29	40	50	120		330	220		800	

First Year

(Semester I & II)

First Semester

EG1101SH	Communication Nepali
EG1102SH	Communication English I
EG1103SH	Engineering Mathematics I
EG1104SH	Engineering Physics I
EG1105SH	Engineering Chemistry I
EG1102AR	Survey Drawing
EG1101GE	Survey Instruments and Concepts

कम्युनिकेसन नेपाली

ई.जी. ११०१ एस.एच.

वर्ष : प्रथम
सेमेष्टर : प्रथम

जम्मा: २ घण्टा/ हप्ता
प्रवचन: २ घण्टा/ हप्ता
पूर्णांक : ५०

कोर्षको परिचय

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

कोर्षको उद्देश्य :

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

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

पाठ्यांशको विषयवस्तु

एकाइ १: संचारात्मक नेपाली भाषा

(७)

१.१ भाषिक भेदको परिचय

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

१.२ दैनिक कार्यमा प्रयोग हुने भाषाको ज्ञान र प्रयोग

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

एकाइ २: लेखन सीप

(१८)

२.१ बोध, शब्दनिर्माण र शब्दभण्डारको ज्ञान र अभ्यास

- क) शब्द भण्डार निर्माण र अभ्यास
 - उपसर्ग
 - प्रत्यय, (कृत् तथा तद्धित)
 - समास
 - प्राविधिक तथा पारिभाषिक शब्दहरूको ज्ञान र प्रयोग
- ख) प्राविधिक/पारिभाषिक शब्दहरूको शब्दस्रोत,
 - वर्णविन्यास (प्राविधिक शब्दका सन्दर्भमा आवश्यक मात्र)
 - अर्थ र व्युत्पत्तिका लागि शब्दकोशको प्रयोगको अभ्यास

२.२ बुँदाटिपोट, सङ्क्षेपीकरण

- बुँदा लेखन
- सारांश लेखन

२.३ अनुच्छेद लेखन /प्रतिवेदन लेखन

२.४ निबन्ध लेखन

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

२.६ संवाद लेखन

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

(५)

३.१ कृति परिचयको ढाँचा :

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

३.२ कृतिहरू :

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

सिकाई सामग्रीहरू

- त्रि. वि. पाठ्यक्रम विकास केन्द्र, अनिवार्य नेपाली शिक्षण निर्देशन, काठमाण्डौं
- लालानाथ सुवेदी, 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. Familiarize with English sound and basic structures.
2. Communicate in English language at work/job environment
3. Define and use trade related technical terminologies
4. Demonstrate situational/structural conversation essential for job performance
5. Demonstrate various writing skills

Course Contents:

Unit 1. English sound and basic structures:	[2]
1.1. Define with examples:	
• Phonemes	
• Morphemes	
1.2. Introduction to English sounds with examples:	[2]
• The Vowels	
• The Consonants	
1.3. Dictionary skills	[3]
• Alphabetical order	
• Dictionary entry	
• Guide words, head words	
1.4. Spellings	[1]
• British and American English spelling	
Unit 2. Introduction to grammatical units with examples:	
2.1 Grammatical units	[2]
• The word	
• The phrase	
• The clause	
• The sentence	
2.2 Types of sentence	[2]
• Forms	
• Function	
2.3 Communicative functions	[4]
• Introducing	
• Requests and offers	
• Expressing gratuities	
• Expressing likes/dislikes	
• Asking for permission	
• Agreeing/disagreeing	
• Encouraging/discouraging	

- Inviting/making invites
- Accepting/declining
- Suggesting/advising
- Making and receiving telephone calls
- Group discussing and presentation

Unit 3. Reading: [2]

- Reading comprehension
- Defining trade related terminologies

Unit 4. Writing skills in English: [12]

- 4.1. Writing paragraphs
- 4.2. Writing dialogues
- 4.3. Writing precises/summaries
- 4.4. Writing letters
 - Job application with resumes
 - Leave application
 - Business letters
 - Orders
 - Complains
- 4.5. Writing essays
- 4.6. Writing technical reports
- 4.7. Writing meeting minutes
- 4.8. Writing notices
- 4.9. Writing notices
- 4.10. Writing instructions
- 4.11. Writing technical proposal

Learning materials:

1. Poudel, R.C., A Manual to Communicative English, K.P. Pustak Bhandar, Kathmandu, 1956/57.
2. Shah, B.L., A text book of writing skills in English, First edition Hira Books Enterprises, Kathmandu,
3. Fruehling, R. T. and Oldham N. B., Write to the point, McGraw- Hill, Inc. New York NY 10020
4. Taylor, G., English conversation practice, 1975.
5. Maharjan L. B., A textbook of English sounds and Structures, Vidyarthi Pustak Bhandar, Kathmandu, 2000.
6. Todd, LAN introduction to Linguistics, Longman York press, 1991.
7. Blundell, Jon, Higgins, Jonathan & Middlemiss, Nigel, Function of English, Oxford University Press
8. Naterop, Jean, Reuell, Rod, Telephoning in English, Cambridge University Press,
9. Better English Pronunciation, Cambridge University Press, New edition
10. Link English, Central Department of English, Tribhuvan University
11. References to be selected by the related lecturer(s) from among the texts available in the market that meet the content needs of this subject.
12. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject.

Engineering Mathematics I

EG 1103 SH

Year: I
Semester: I

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

Course Description:

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

Course Objectives:

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

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

Course Contents:

Unit 1. Trigonometry: [12]

- 1.1. Review of trigonometric ratios:
 - Basic trigonometric formulae
 - Identities and conditional identities.
- 1.2. Trigonometric equations:
 - Periodicity of trigonometric functions
 - General solutions of the following equations:
 - $\sin x = k$, $\cos x = k$ and $\tan x = k$ and using trigonometric equations.
- 1.3. Inverse circular functions:
 - Domain and their graphs
 - Formulae involving inverse circular functions
 - Simple identities and equations involving circular functions
- 1.4. Properties of triangles:
 - The sin law
 - The cosine law
 - The projection law
 - The half angle formulae
 - The area of a triangle
 - The encircles and ex-circles of a triangle

Unit 2. Coordinate Geometry: [12]

- 2.1 Straight lines:
 - The three standard forms of equations of a line.
 - The linear equation: $ax + by + c = 0$.
 - Any line through the intersection of two lines.
 - Concurrency of lines.
- 2.2 Pair of straight lines:
 - Angle between two lines
 - Bisectors of angles between two lines
 - Pair of lines
 - Homogeneous equation of second degree
 - General equation of second degree representing two lines

- Angle between a pair of lines
 - Bisectors of the angles for a line pair
 - Lines joining the origin to the points of intersection of a curve and a line
- 2.3. Circle:
- Standard equation
 - General form
 - Tangents and normal
- 2.4. Parabola:
- Standard equation
 - Tangents and normal
- Unit 3. Algebra:** [12]
- 3.1. Progressions:
- A.P., G.P. and H.P.
- 3.2. Permutations and combinations
- 3.3. The binomial theorem for any index
- 3.4. Series:
- Exponential & logarithmic
- 3.4. Equations:
- Quadratic & polynomial
- Unit 4. Set relation and function:** [8]
- 4.1 Idea of set, set notations, set operations,
- 4.2. Venn diagram,
- 4.3. The set of real members and its subsets.
- 4.4. The absolute value of a real number.
- 4.5. Functions- algebraic and transcendental.
- 4.6. Graphs of simple function.
- Unit 5. Calculus:** [16]
- 5.1. Limit of community.
- 5.2. Derivatives from definition of simple functions like:
- x^n , $(ax+b)^n$, $\sin(ax + b)$, e^{ax} , a^x , and $\log x$.
- 5.3. Derivatives of sum, difference, product and quotient of functions, chain rule, parametric and implicit functions
- 5.4. Integration, Rules for finding integrals.
- 5.5. Standard integrals and their uses.
- 5.6. Definite integrals- definition and evaluation.
- 5.7. Definite integral as limit of sum.

Learning materials:

1. A Textbook on Engineering mathematics (for Diploma Engineering) part I, Bhim Prasad kafle, Makalu Publicartion House, Dillibazar, Kathmandu
2. A Text book of Statistics – B.C. Bajracharya
3. Elementary Statistics – H. C. Saxena
4. Statistical Methods – Mrigendralal Singh
5. Engineering Mathematics I, Hari Nandan Nath, Parishowar Acharya, Vudhyarthi Publisher and distributors, Bhotahity, Kathmandu
6. References to be selected by the related lecturer(s) from among the texts available in the market that meet the content needs of this subject.
7. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject

Engineering Physics I

EG 1104 SH

Year: I
Semester: I

Total: 6 hour /week
Lecture: 3 hours/week
Tutorial: 1 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description:

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

Course Objectives:

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

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

Course Contents:

Unit 1. Mechanics:

[15]

- 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 (Triangle law and parallelogram law of vectors)
- 1.2 Newton's laws of motion:
 - Newton's laws of motion (First, second and third laws)
 - Principle of conservation of linear momentum
 - Solid friction: Dynamic and rolling friction, laws of solid friction and its verification
- 1.3. Uniform circular motion:
 - Angular displacement and velocity.
 - Centripetal force and acceleration.
 - Motion of bicycle rider
- 1.4. Gravitation:
 - Newton's law of universal gravitation.
 - Gravitational attraction of earth:
 - Acceleration due to gravity.
 - Variation of acceleration due to gravity with height, depth, and latitude.
 - Motion of satellites:
 - Orbital velocity,
 - Geostationary satellites.
 - Weightlessness, motion of lift
- 1.5. Work, energy, and power:
 - Definition and units of work, energy and power.
 - Potential and kinetic energy.
 - Conservation of energy.
 - Conservative forces.
- 1.6. Simple harmonic motion (SHM):
 - Simple harmonic motion and its characteristics.
 - Energy of simple harmonic motion.
 - Simple pendulum.

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

Unit 2. Heat and thermodynamics:

[12]

- 2.1 Heat Phenomena and Quantity of Heat:
- Concept of temperature and thermal equilibrium.
 - Temperature of scales.
 - Quantity of heat gain or heat loss.
 - Specific heat capacity.
 - Determination of heat capacity by the method of mixtures.
 - Newton's law of cooling.
- 2.2 Change of Phase:
- States of matter.
 - Fusion and vaporization.
 - Evaporation and boiling.
 - Specific latent heats of fusion and vaporization.
 - Melting and boiling points.
 - Introduction of Saturated and unsaturated vapors.
 - Variation of melting and boiling points with pressure.
 - Triple point and critical point.
 - Dew point and humidity.
- 2.3 Thermal Expansion:
- Coefficients of linear, superficial and cubical expansions of solid and relation between them.
 - Cubical expansion of liquids.
 - Real and apparent expansions.
 - Variation of density due to expansion.
- 2.4 Heat Transfer:
- Thermal conduction and thermal conductivity
 - Convection
 - Radiation.
 - Perfectly black body.
 - Stefan-Boltzman's law of black body radiation.
- 2.5 Gas Laws:
- Boyle's law,
 - Charles law and ideal gas equation.
 - Universal gas constant,
 - Avogadro number and Boltzman constant.
 - Volume and pressure coefficients of ideal gas.
- 2.6 Kinetic Theory of Gases:
- Pressure in an ideal gas from molecular point of view.
 - RMS speed, mean energy of a molecule of an ideal gas.
- 2.7 Thermodynamics:
- First law of thermodynamics.
 - Different thermodynamic process:
 - Adiabatic (equation and work done)
 - isothermal (equation and work done)
 - Isobaric and Isochoric
 - Specific and molar heat capacities for different thermodynamic processes, $C_p - C_v = R$.

- Second law of thermodynamics.
 - Efficiency of heat engine
- Unit 3. Optics:** [8]
- 3.1 Reflection by plane surfaces
- Nature of light, sources of light
 - Review of reflection by plane surfaces
 - Deviation due to reflection
 - Deviation of light due to plane mirror
 - Deviation of light due to rotating mirror
- 3.2 Refraction by plane Surfaces:
- Review of refraction by plane surfaces.
 - Lateral shift
 - Total internal reflection, critical angle
 - Real and apparent depth.
- 3.3 Reflection by Spherical Surfaces:
- Review of reflection by spherical surfaces.
 - Construction of image by ray diagrams and nature of images
 - Real and virtual images.
 - Nature of images formed by spherical mirrors.
 - Mirror formula for concave and convex mirror
- 3.4 Refraction through Prisms and Lenses:
- Deviation due to prism and minimum deviation.
 - Refraction through lenses.
 - Lens maker equation.
 - Lens formula for converging lens, diverging lens
 - Formation of images by lenses.
 - Combination of lenses.
 - Magnification,
 - Power of a lens.
- Unit 4. Magnetism:** [10]
- 4.1 Magnets and Magnetic fields:
- Magnetic poles, magnetic moment, magnetic axis, and magnetic meridian.
 - Magnetic field.
 - Coulomb's law for magnetism.
 - Magnetic field due to magnetic poles and bar magnets.
 - Intensity and flux density of magnetic field.
 - Neutral point.
 - Tangent law.
- 4.2. Earth's Magnetism:
- Horizontal and vertical components of earth's magnetic field.
 - Declination and angle of dip.
- 4.3. Magnetic properties of materials;
- Molecular and modern theory of magnetism.
 - Para magnetism and diamagnetism:
 - Permeability and
 - Susceptibility.
 - Intensity of magnetization.
 - Domain theory of ferromagnetism.
 - Hysterisis

Engineering Physics Practical I

[30]

1. Determine volume of hallow cylinder by using vernier calipers.

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

Learning materials:

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

Other learning materials:

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

Engineering Chemistry I

EG 1105 SH

Year: I
Semester: I

Total: 6 hour /week
Lecture: 3 hours/week
Tutorial: 1 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description:

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

Course Objectives:

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

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

Course Content:

Unit: 1: Language of chemistry:

[4]

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

Unit: 2: General chemistry:

[8]

- 2.1 Atom and molecule:
 - Definition
 - Dalton's atomic theory and modern position of the theory
- 2.2 Atomic weight:
 - Definition
 - Determination of atomic weight by Dulong and Petit's method and Related numerical problems
- 2.3 Molecular Weight:
 - Definition
 - Avogadro's hypothesis
 - Application of Avogadro's hypotheses (Mol. Wt= $2 \times V.D.$, in the deduction of atomicity of elementary gases H₂, Cl₂, O₂, and N₂)
 - Molecular weight determination by Victor Meyer's method and Related numerical problems
- 2.4 Equivalent weight:
 - Definition
 - Equivalent weight of element, acid, base and salt

- Equivalent weight determination by hydrogen displacement method and oxide method.
 - Numerical relation between equivalent weight, atomic weight and valency
 - Some related problems of equivalent wt. (From Hydrogen displacement method and oxide method)
- 2.5 Simple mole concept:
- Mole of an atom
 - Mole of a molecule
 - Molar volume and
 - Simple calculation on mole concept

Unit: 3: System of classification:

[33]

- 3.1 Acid, Base and Salt:
- Arrhenius concept of acid and base
 - Lowry and Bronsted concept of acid and base
 - Conjugate acid and base
 - Amphoteric nature of water
 - Lewis concept of acid and base
 - Properties of acid and base.
 - Definition of Salt
 - Types of salt (normal, acidic and basic)
 - Concept of hydrogen ion concentration, pH value and pH Scale
 - Buffer solution.
- 3.2 Volumetric analysis:
- Definition of titration (acidimetry and alkalimetry),
 - Indicator
 - End-point (neutralization point)
 - Standard solution (primary and secondary standard solution), Normal, Decinormal, Molar, Molal solution
 - Requisites of primary standard substance
 - Volumetric equation,
 - Express the strength of solution Normality, Molarity, Molality, gram per litre and percentage and related numerical problems
- 3.3 Periodic table:
- Mendeleef's periodic law
 - Mendeleef's periodic table
 - Characteristics of groups and periods in the table
 - Advantages and anomalies of the periodic table
 - Modern periodic law
- 3.4 Electronic theory valency:
- Assumptions
 - Types
 - Electrovalency eg. NaCl, MgO, CaS
 - Covalency eg. H₂, O₂, N₂, CH₄, H₂O, NH₃, C₂H₂
 - Coordinate co-valency eg. H₂O₂, SO₂, O₃, SO₃
 - Electronic dot structure of some compounds eg. H₂SO₄, CaCO₃, K₂SO₃
- 3.5 Electrolysis:
- Definition of electrolyte, non-electrolyte and electrolysis
 - Faraday laws of electrolysis,
 - Application of electrolysis (electroplating and electro refining)
 - Electrolysis of acidulated water
- 3.6 Oxidation and reduction:
- Classical definition

- Electronic interpretation
 - Oxidizing agent: Definition and eg O₂, O₃, oxyacids, halogens, K₂Cr₂O₇, KMnO₄
 - Reducing agent: Definition and eg. H₂, H₂S with some examples,
 - auto-oxidation eg. H₂O₂, HNO₂, SO₂
 - Idea of oxidation number
 - Balancing chemical equation by oxidation number method
- 3.7 Atomic structure:
- Subatomic particles (electron, proton and neutron)
 - Classical α - rays scattering experiment
 - Rutherford's atomic model and its drawbacks
 - Bohr's atomic model (postulates only)
 - Composition of nucleus
 - Mass number and atomic number
 - Isotopes and isobar
 - Arrangement of electron (Bohr - Bury Scheme)
 - Concept of shell and sub shell,
 - Electronic Configuration and atomic structure of Some elements (Atomic no. 1 to 30)
 - Hund's rule
 - General idea of quantum number and Pauli's exclusion principle
- 3.8 Corrosion:
- Definition
 - Types
 - Direct and indirect method and prevention against corrosion
- 3.9 Activity and electrochemical series:
- Definition
 - Action of water, acid and oxygen on metals.

Engineering Chemistry Practical I

[30]

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

12. To standardize given unknown alkali (approximately N/10) solution with the help of by preparing standard acid solution. (Expression of strength in different ways) [2]
13. To carry out conductivity experiments on solids and liquids (CuSO₄, Zn, Mg, Al, Fe, CCl₄, C₆H₆, C₂H₅OH) [2]

Text books:

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

Reference books:

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

Other learning materials:

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

Survey Drawing EG 1102 AR

Year: I
Semester: I

Total: 9 hours/week
Lecture: 1 hours/week
Tutorial: hours/week
Practical: 8 hours/week

Course Description:

This course consists of fundamental concept of manual drawing skills along with engineering drawing applicable in surveying and mapping.

Course Objectives:

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

- Identify the drawing tools and equipments required for different drawing tasks
- Understand the surveying related drawings
- Draw simple geometrical figures
- Draw freehand sketches of different shapes
- Interpret Simple Engineering drawing
- Project point, line, plane and geometrical solids
- Represent three dimensional objects in orthographic form and dimension them

Course Contents:

Unit 1: Introduction [2hrs]

- 1.1 Introduction to Engineering Drawing and Survey Drawing
- 1.2 Uses of Drawing
- 1.3 Different types of Drawing Equipments and Material
- 1.4 Maintenance and Care of Drawing Equipments
- 1.5 Conventional line types and sheet layout

Practical:

- 1) Demonstration of Different Drawing Equipments and Materials. [1hrs]
- 2) Exercise on drawing conventional lines types & sheet layout. [2hrs]

Unit2: Lettering [2hrs]

- 2.1 General procedure for freehand lettering
- 2.2 Single stroke vertical capital letters, single stroke inclined capital letters, single stroke vertical lowercase letters; single stroke inclined lowercase letters, vertical and inclined numerals and symbols
- 2.3 Devnagari and Roman Letters

Practical:

- 1) Write Devanagari Letters of different sizes [4hrs]
- 2) Write Roman Letters of different sizes [4hrs]

Unit 3: Geometrical Construction and dimensioning [2hrs]

- 3.1 Introduction to Plane Figures (Regular and Irregular)
- 3.2 Rules and Techniques of dimensioning two dimensional figures
- 3.3 Dimensioning pectoral view and orthographic views
- 3.4 Conic Sections

Practical:

1. Bisection and trisection of straight lines and angles [2hrs]
2. To draw perpendicular lines & parallel lines, to draw an arc tangent to given straight lines [3hrs]
3. To draw an arc tangent to given two circles [3hrs]
4. Construct Triangles: Equilateral, Isosceles and Scalene [2hrs]
5. Construct Quadrilaterals: Square, Rectangle, Rhombus, Trapezoid [3hrs]
6. Construct Regular Polygons for each type (Pentagon, Hexagon, Heptagon, Octagon) [4hrs]
7. Divide a given straight line into any number of equal parts [2hrs]
8. Construction of ellipse, hyperbola and parabola [10hrs]

Unit 4: Drawing Techniques

- 4.1 Scales: Types, Construction and Use
- 4.2 Types of Charts: Bar Diagram, Pie-diagram
- 4.3 Conventional symbols used in Topographic map and Cadastral map

Practical:

1. Construct Plain Scale [4hrs]
2. Construct Diagonal Scale [4hrs]
3. Prepare Bar diagram and Pie-Diagram from the given Data [3hrs]
4. Trace given fragment of topographic and cadastral map [4hr]

Unit 5: Freehand Sketching

- 5.1 Technique of sketching
- 5.2 Sketching Materials
- 5.3 Proportion: Estimation of Distance and Direction
- 5.4 Use of Sketching in Surveying and Mapping

Practical:

1. Prepare a Freehand Sketch of the given area. [2hrs]

Unit 6: Projection

[2hrs]

6.1 Introduction to orthographic projection

- 6.1.1 Theory of projection
- 6.1.2 Four quadrant, plane of projection
- 6.1.3 Isometric Projection

6.2 Point and line projection

[2hrs]

6.2.1 HP, VP and PP

- 6.2.2 Location and 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

[2hrs]

- 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

[2hrs]

- 6.4.1 Orthographic projection of geometrical solid i.e. prism, cylinder and cone in simple position
- 6.4.2. Orthographic projection of different model or work pieces.

Practical:

- 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 [8hrs]
- 2) Construct an Orthographic Projection of given Solid Figures [8hrs]
- 3) **Draw Isometric projection**

Reference Book

1. *Fundamental of Engineering Drawing*, Warven J. Cauzadder (2001)
2. *Engineering Drawing Volume 1 and 2* by K.R. Gopalkrishna
3. *Engineering Drawing and AutoCAD*, K. Venugopal (2001)

Survey Instruments & Concepts

EG 1101 GE

Year: I
Semester: I

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

Course Description:

This part of the course deals with Ranging equipments, Surface Distance measuring instruments, Direction measurements by compass and Graphical surveying instruments

Course Objectives:

After the completion of this course, students will

- be acquainted with and be able to explain the use of different instruments used for aligning, making linear and angular measurements
- be able to use those instruments for making basic linear measurements
- be able to explain the elements of Direction measurements and Bearings.

Course Guidelines

The students shall be required to carry out the following tasks for each instrument / equipment listed in the course content:

1. Practice with the instrument in the field.
2. Prepare drawing/s of the instrument/equipment in the form of neat labelled diagram/s
3. Prepare practical sheets document containing Relevant drawing/s, Description, Components, Types, Accessories, Principle, Adjustments, Functions and Use, Care, Operational/Field procedure and observation record.

Course Contents:

Theory (30 hours)

Unit 1: Ranging Instruments	(4 hrs)
1.1 Signals and Ranging Rod	
1.2 line ranger	
1.3 Cross Staff and Optical Square	
Unit 2: Distance Measuring Instruments	(2 hrs)
2.1 Chain and its types	
2.2 Measuring Tape and its types	
Unit 3: Angular measurement Instruments	(6 hrs)
3.1 Principle of Direction Measurements	
• Reference Planes (Horizontal, Vertical, Inclined).	
• Reference Axes for measuring angles between points on the earth surface. (Horizontal, Vertical, Collimation).	
3.2 Direction elements:	
• Meridians and types of meridians used	
• Bearing, types of bearings and conversion of bearings	
3.3 Essential components in a direction measuring instrument	
3.4 Instrument for direction measurements - Magnetic Compass	
3.5 Instrument for direction measurements - Surveyor's compass	
3.6 Theodolite	
• Parts of theodolite	

- Types of theodolite: vernier theodolite, microoptic theodolite, digital theodolite
- Measurement of angle by theodolite

Unit 4:	Graphical Surveying Instruments	(6 hrs)
	4.1 Plane Table	
	4.2 Sight Rule	
	4.3 Telescopic Alidade and Staff	
	4.4 Indian Clinometer	
Unit 5:	Distance Measuring Instruments	(4 hrs)
	5.1 Theodolites and Staff	
	5.2 Theodolite and Subtense Bar	
	5.3 Electronic Distance Meters (EDM)	
Unit 6:	Heighting Instruments	(4hrs)
	6.1 Simple spirit level	
	6.2 Abney Level	
	6.3 Leveling instruments and accessories	
	<ul style="list-style-type: none"> • Dumpy Level • Tilting Level • Automatic Level • Digital/Electronic Level 	
Unit 7:	Total Station	(2 hrs)
Unit 8:	GNSS	
	8.1 Handheld GPS	(2hrs)

Practical (90 hour)

1. Fix and set up ranging rod verticality using eye judgment and plumb bob (4hrs)
2. Range a line by direct ranging using line ranger and eye judgment (4hrs)
3. Set up Reciprocal ranging (4 hrs)
4. Measure distance by using tape /chain (8 hrs)
5. Measure horizontal distance on slope using tape by stepping method (8 hrs)
6. Determine horizontal distance from slope distance and vertical angle with abney level (4 hrs)
7. Measure bearing of line with compass (6 hrs)
8. Perform temporary Adjustment of plane table (8 hrs)
9. Handle theodolite (10 hrs)
10. Measure horizontal and vertical angle with theodolite (8 hrs)
11. Handle level instrument and its temporary adjustment (4 hrs)
12. Determine height difference between two points by leveling (10 hrs)
13. Handle total station for basic measurements (16 hrs)
14. Handle total station, data download and mapping (Demo) (4 hrs)
15. Demonstrate handheld GPS (Demo) (6 hrs)
16. Draw Sketch of survey instruments and Stations mark (16 hrs)

Reference Books

1. *Surveying Vol. I Dr. B.C Punmia, Laxmi Publication Pvt.Ltd*
2. *Surveying Vol. I S.K. Duggal, Tata McGraw- Hill Publishing Company Ltd. New Delhi*
3. *Principles and use of Surveying Instruments, J. Clendinning, J.G Oliver*

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 1204 SH | Communication English II |
| 5 | EG 1201 GE | Fundamentals of Surveying and Geomatics |
| 6 | EG 1221 CT | Computer Application |

Engineering Mathematics II

EG 1201 SH

Year: I
Semester: II

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

Course Description:

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

Course Objectives:

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

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

Course Contents:

- Unit 1. Vectors:** [9]
- 1.1. Vectors in plane, addition and subtraction.
 - 1.2. Composition and decomposition of vectors.
 - 1.3. Vectors in space.
 - 1.4. The unit vectors i, j, k
 - 1.5. Product of two vectors-
 - dot product,
 - cross product,
 - 1.6. Simple applications.
- Unit 2. Algebra:** [15]
- 2.1. Complex number in the form $A+ ib$.
 - Algebra of complex numbers.
 - Polar representation of complex numbers.
 - 2.2. De Moivre's theorem and its applications
 - 2.3. Linear inequalities and their graphs.
 - System of linear inequalities in two variables,
 - System of linear inequalities in two variables,
 - Linear programming: Problems involving two variables under given linear constraints
 - 2.4. Determinants and matrices,
 - Algebra of matrices,
 - Properties of determinants,
 - Ad joint and inverse of matrices.
 - Solution of linear equations using crammers' rule
 - Row equivalent matrices
 - Idea of polynomial equations
- Unit 3. Calculus:** [9]

- 3.1. Applications of derivatives-
 - Tangents and normal to a curve taking slope as derivative
 - Maxima and minima of a function
 - Derivative as rate of change
- 3.2 Areas under curves:
 - Use of definite integral as limit of a sum to find areas under curves
 - Areas of closed curves and
 - Areas between curves.
- 3.3 Antiderivatives:
 - Curve tracing, maxima and minima
 - Rieman sums & integral
 - Application of fundamental theorem

Unit 4. Geometry: [6]

- 4.1. Coordinates in space,
- 4.2. Coordinates in planes.

Unit 5. Statistics: [6]

- 5.1. Statistics:
 - Introduction to statistics
 - Measures of Central Tendency
 - Measures of Dispersion
 - Moments, Skew ness and Kurtosis
 - Correlation and Regression
- 5.2. Probability:
 - Concept of Probability
 - Concept of conditioned probability
 - Concept of independent and dependent events
 - Concept of mutually exclusive events

Learning materials:

1. A Textbook on Engineering mathematics (for Diploma in Engineering) part II, Bhim Prasad kafle, Makalu Publicartion House, Dillibazar, Kathmandu
2. A Text book of Statistics – B.C. Bajracharya
3. Elementary Statistics – H. C. Saxena
4. Statistical Methods – Mrigendralal Singh
5. Engineering Mathematics I, Hari Nandan Nath, Parishowar Acharya, Vudhyarthi Publisher and distributors, Bhotahity, Kathmandu
6. References to be selected by the related lecturer(s) from among the texts available in the market that meet the content needs of this subject.
7. The related institute may develop its own textbook and approve from the related authority so as to have a prescribed textbook of this subject

Engineering Physics II

EG 1202 SH

Year: I
Semester: II

Total: 6 hour /week
Lecture: 3 hours/week
Tutorial: 1 hours/week
Practical: hours/week
Lab: 2 hours/week

Course Description:

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

Course Objectives:

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

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

Content Contents:

Unit 1. Electricity:

[16]

1.1. Electrostatics:

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

1.2. Current electricity:

- Basics:
- D.C. Current.
- Strength of Current.
- Potential difference across a conductor.
- Ohm's law and its verification.
- Resistance and resistivity.
- Electrical measurements:
- Galvanometer, Ammeter and voltmeter
- Conversion of Galvanometer into Ammeter and voltmeter
- Potentiometer and comparison of emf and measurement of internal resistance
- Kirchhoff's law and their use to analyze simple circuits, Wheatstone bridge
- Heating effect of current:

- Joules law and its verification, electric power, maximum power theorem
 - The rate of heating from the concept of p.d.
 - Thermoelectricity:
 - See-beck effect, variation of thermo e.m.f. with temperature
 - Peltier effect and
 - Thomson effect.
- 1.3. Magnetic effect of current and electromagnetism:
- Magnetic forces and magnetic field of current:
 - Force experienced by charge moving in magnetic field.
 - Maxwell's 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 and long straight conductor.
 - Electromagnetic induction:
 - Faraday's law of electromagnetic induction and Lenz's law.
 - Phenomenon of self-induction.
 - A.C. generator.
 - D.C. generator.
 - Transformer.
- 1.4. Alternating current:
- Instantaneous and effective values of current and voltage.
 - Phase between current and voltage across different elements of circuit.
 - Capacitive and inductive reactance.
 - Impedance.
 - Resonance.
 - Power in a.c. circuit

Unit 2. Waves:

[9]

- 2.1. Wave motion:
- Wave motion.
 - Types of wave motion
 - Characteristics of wave motion
 - Wavelength, frequency and speed of waves
 - Speed of waves in different media.
 - Velocity of sound in air.
- 2.2. Wave phenomena:
- Sound waves.
 - Beats and their formation.
 - Progressive waves.
 - Stationary waves.
 - Waves in strings and pipes: fundamental vibrations and overtones.
 - Intensity of sound.
 - Intensity level.
 - Inverse square law.
- 2.3. Physical optics:
- Interference of light waves and coherent sources.
 - Phase difference and path difference. Young's double slit experiment.
 - Introduction of Diffraction of light waves.
 - Introduction of Huygen's principle.

- Unit 3. Properties of matter:** [10]
- Polarization and unpolarized lights, polarization by reflection (Brewster's law)
- 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, capillary action
 - Coefficient of surface tension and surface energy (Only introduction).
- 3.3 Viscosity:
- Stream line and turbulent flows.
 - Idea of liquid layer, Velocity gradient, Viscosity and its coefficient.
 - Comparison of viscosity with solid friction, Viscous forces, Stoke's law, Terminal velocity, determination of coefficient viscosity
- Unit 4. Modern physics:** [10]
- 4.1 Atomic physics:
- Photons, Photoelectric effect, Einstein's photoelectric equation and stopping potential for photoelectrons.
 - Motion of charged particles in simultaneously applied electric and magnetic fields, e/m for electron, Milliken's oil drop experiment. Bohr model for hydrogen atom. Energy level diagrams and spectral series.
 - X-rays: Production, nature and uses.
 - Laser (introduction only)
- 4.2 Semiconductors:
- Energy states of valent electrons in solids, energy bands.
 - Semiconductors, intrinsic and doped, p-type and n-type semiconductors.
 - Majority and minority carries.
 - Acceptors and donors, p-n junction, diode and depletion layer, forward and reverse bias.
 - Rectifying property of diode
 - Transistor and its uses
- 4.3 Nuclear physics:
- Laws of radioactive disintegration: half life, mean life, and decay constant.
 - Stable and radioactive nuclei.
 - Binding energy and mass defect
 - Fission and fusion.

Engineering Physics Practical II: [30]

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

Learning materials:

Text books:

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

Text book for laboratory work:

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

Other learning materials:

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

Course Description:

This subject consists of three units related to nonmetals and their compounds; metals and their compounds; and organic compounds and synthetic materials necessary to develop background in chemistry that supports for the understanding and practicing related engineering works.

Course Objectives:

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

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

Course Content:

Unit: 1: Non-metals and their compounds:

[20]

- 1.1 Water:
 - Source of water
 - Hard and soft water
 - Removal of temporary and permanent hardness of water
 - Water treatment of domestic and industrial purpose
- 1.2 Ammonia:
 - Lab preparation
 - Manufacture by Haber's process
 - Properties and uses
- 1.3 Nitric acid:
 - Manufacture by Ostwald's process
 - Properties and uses.
 - Nitrogen cycle
 - Fixation of Nitrogen
 - Chemical fertilizers
 - Oxides of nitrogen as pollutant (general concept)
 - Acid rain (due to oxides of nitrogen and oxide of Sulphur "Sulphur dioxide")
- 1.4 Halogens (Chlorine):
 - Lab preparation
 - Properties and uses
- 1.5 Hydrochloric acid:
 - Lab preparation
 - Properties and uses
- 1.6 Hydrogen Sulphide:
 - Lab preparation
 - Properties and uses
- 1.7 Sulphuric acid:
 - Manufacture by contact process)
 - Properties and uses
- 1.8 Carbon and its compounds:
 - Allotropes of carbon (reference of diamond & graphite & their structure).
 - Oxides of carbon (Ref. carbon dioxide & carbon mono oxide as pollutants)- general idea only

Unit: 2: Metals and their compounds:

[15]

- 2.1 General study of metals and their components:
 - Difference between metal and non metal
 - Combined & free state of metals
 - Chemistry of Metallic Carbonates, Sulphates, Chlorides and Nitrates
- 2.2 Alkali metals:
 - General characteristics of Alkali metals
 - Properties & uses of sodium
- 2.3 Alkaline earth metals:
 - General characteristics of the Alkaline earth metals
 - Properties & uses of calcium
- 2.4 Aluminum:
 - Properties and uses
- 2.5 Coinage metals:
 - General properties of coinage metals
 - Properties and uses of copper
- 2.6 Zinc:
 - Properties & uses
- 2.7 Iron:
 - Properties & uses
- 2.8 Lead:
 - Properties & uses
- 2.9 Alloys:
 - Definition
 - Purpose of making alloys
 - Types of alloys

Unit: 3: Organic compounds and synthetic materials:

[10]

- 3.1. Organic compounds
 - Organic compounds:
 - Historical background, classification, and nomenclature
 - Functional groups and homologous series
 - Saturated hydrocarbon: Properties of Methane
 - Unsaturated hydrocarbon: Properties of Ethylene and Acetylene
 - Aromatic compounds:
 - Definition
 - Comparison of aliphatic and aromatic compounds
 - Properties of Benzene
- 3.2. Synthetic materials:
 - Polymer and polymerization
 - Definition
 - Types of polymer
 - Rubber:
 - Types (Natural and Synthetic)
 - Preparation and uses.
 - Polyvinyl chloride (PVC):
 - Preparation and uses
 - Polythene:
 - Preparation and uses

Engineering Chemistry Practical II:

- 1. To compare the hardness of different types of water [2]
- 2. To prepare Bakelite (resin) in the laboratory [2]
- 3. To determine the condition in which corrosion takes place [2]
- 4. To investigate the action of acids on some metals (Zn, Mg, Fe, Al, Sn)

- & Cu) (acids: HCl, H₂SO₄(dil.)& HNO₃ (dil) [2]
5. To prepare and study the properties of hydrogen gas [2]
 6. To prepare and study the properties of ammonia gas [2]
 7. To prepare and study the properties of hydrogen Sulphide gas. (This gas should not be prepared individually in woulf bottle but in Kipp's apparatus commonly) [2]
 8. To detect the acid radicals (Cl⁻, NO₃⁻, SO₄²⁻, CO₃²⁻) by dry and wet ways (4)
 9. To detect the basic radicals (Cu⁺⁺, Al⁺⁺⁺, Fe⁺⁺⁺, Zn⁺⁺, CO⁺⁺, Ni⁺⁺, Ca⁺⁺, Ba⁺⁺, Mg⁺⁺)by wet ways [6]
 10. To detect the acid and basic radicals (complete salt analysis) [6]

Textbooks:

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

Reference books:

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

Communicative English II EG 1204 SH

Year: I
Semester: II

Total: 2 hour /week
Lecture: 2 hours/week
Tutorial: hours/week
Practical: hours/week

Course Description:

This course consists of four units related to practice based 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:

6. Communicate in English language at work/job environment
7. Define and use trade related technical terminologies
8. Demonstrate various writing skills related to the job
9. Demonstrate situational/structural conversation essential for job performance

Course Contents:

Unit 1. Communicative English:

[3]

1.1 The correct usage:

- Introduction
- Grammatical units:
- Subject –verb agreement
- Nouns and pronouns
- The adjectives
- The articles
- The verbs
- The adverbs
- The prepositions
- The conjunctions

1.2 The grammatical structures:

- The order of words
- The idioms
- The punctuation
- The spelling
- The formation of words
- Figures of speech
- The verb patterns
- Question tags, short answers, etc.
- More structures

1.3. Everyday functions ii.

1.4. Asking about trouble/problem.

1.5. Inviting to join an activity.

1.6. Asking about / expressing.

1.7. Asking about / stating.

1.8. Functions of English.

1.9. Dictionary usage

1.10. Reading comprehension

1.11. Collection and definitions of job related terminologies

Unit 2. Writing skills in English:

[15hrs]

- 2.1. Writing comprehension
- 2.2. Writing Dialogues
- 2.3. Paraphrasing
- 2.4. Writing Responses:
 - Complaint letters
 - Social letters
 - Response to business letters
 - Response to Invitation letters
- 2.5. Documentation
 - In text citation
 - Bibliography
- 2.6. Essay Writing
 - Descriptive essay
 - Argumentative essay
 - Cause and effect essay
 - Comparative essay
- 2.7. Report Writing
 - Prepare an academic report practically

Unit 3. English sounds and structures: [4 hrs]

- 3.1 Individual oral presentation
- 3.2 Reinforcement of Sounds of English:
 - The vowels
 - The consonants
 - Consonant clusters
 - Vowel sequences
 - Syllable structure
 - Stress
 - Intonation
- 3.3 Dictionary usage

Unit 4. Trade Related terminologies [3 hrs]

- Surveying & Mapping
- Geomatics
- Remote Sensing and GIS
- Land Management

Test and revision [5 hrs]

Reference Books:

1. Poudel, R.C., A Manual to Communicative English, K.P.Pustak Bhandar, Kathmandu, 1956/57.
2. Shah ,B.L., A text book of writing skills in English, First edition Hira Books Enterprises, Kathmandu,
3. Fruehling, R. T. and Oldham N. B., Write to the point, McGraw- Hill, Inc. New York NY 10020
4. Tayior, G., English conversation practice, 1975.
5. Maharjan L. B..A textbook of English sounds and Structures, Vidyarthi Pustak Bhandar, Kathmandu, 2000.
6. Todd, LAN introduction to Linguistics, Longman York press, 1991.

Fundamental of Surveying and Geomatics

EG 1201 GE

Year: I
Semester: II

Total: 12 hrs/week
Lecture: 6 hrs/week
Tutorial: hrs/week
Practical: 6 hrs/week

Course Description:

This part of the course is intended to give an introduction to the History of surveying, basic Surveying concepts and principles, different Types of surveying, Linear and Angular Measurements, Map reading, and Measurement Errors.

Course Objectives:

Upon completion of this course, the students will

- have a good understanding of basic surveying concepts
- be able to apply the principles of surveying in surveying projects
- be well acquainted with Linear and Angular measurements and skilled in utilizing different techniques of linear and angular measurements
- be prepared to carry out surveying works to the required level of accuracy
- have acquired an skill of Map Reading

Course Contents:

Unit 1: Historical background	[4 hrs]
1.1 Brief history of Surveying	
1.2 Development of Surveying and Mapping Science	
1.3 Surveying and Mapping in Nepal	
Unit 2: Introduction to Surveying	[10 hrs]
2.1 Surveying and Mapping	
2.2 Functions of a Surveyor	
2.3 Need importance and scope of surveying	
2.4 Objectives of surveying	
2.5 General procedure of Survey and Methods used	
2.6 Surveying Concepts:	
• Distance and Direction;	
• Shape and size of the earth;	
• Curvature of earth	
• Spheroid and Geoid;	
• Earth figure elements- Axis of earth, Great Circle, Equator, Parallels and Meridians, Flattening;	
• Coordinates and Coordinates systems;	
• Latitude, Longitude, Height above MSL	
• Projection	
• Relief representation	
2.7 End products of surveying	
Unit 3: Principles and Classifications	[6 hrs]
3.1 Basic Principles of surveying	
3.2 Primary division of surveying	
3.3 Classification of Surveys: basis of classification and types of surveys	
Unit 4: Measurement Units	[6 hrs]
4.1 Significance of measurement units	
4.2 Standardization of Units	
4.3 Linear, Angular, Surface and Volume units	

	4.4	Conversion of units	
Unit 5:		Map Scale	[10 hrs]
	5.1	Introduction	
	5.2	Expression of map scale and Types of scale	
	5.3	Construction of Graphical scale	
	5.4	Scale and graphical error	
	5.5	Shrunk scale and shrinkage factor,	
	5.6	Importance and uses of map scale	
	5.7	Measurement of wrong scale	
	5.8	Enlargement and reduction of scale	
Unit 6:		Linear Measurements	[14 hrs]
	6.1	Introduction and Principles	
	6.2	Slope, Horizontal and Vertical distances	
	6.3	Direct and indirect linear measurement methods	
	6.4	Optical Distance Measurement	
	6.5	Electronic Distance Measurement	
	6.6	Linear Survey	
	6.7	Linear Survey: field Procedure and plotting	
	6.8	Obstacles in Linear survey and their solution	
	6.9	Errors in linear measurement	
Unit 7:		Angular Measurements	[18 hrs]
	7.1	Principle of direction measurement	
	7.2	Angles and Bearings	
	7.3	Terminologies in compass surveying	
	7.4	Computation of included angles from bearing and vice versa	
	7.5	Magnetic variation and declination	
	7.4	Horizontal and Vertical angles	
	7.5	Local attraction and its solution	
	7.6	Compass Survey field procedure	
	7.7	Plotting and adjustment of compass traverse, plotting of detail	
	7.7	Theodolites Survey	
	7.6	Theodolite:Introduction, parts	
	7.7	Theodolite: basic axes and their relation,	
	7.8	Field procedures for angular measurement by Theodolite	
	7.7	Test and Adjustments of theodolite	
Unit 8:		Map Reading	[6 hrs]
	8.1	Introduction: Maps, Plans and Profiles, Different types of maps	
	8.2	Maps and Photographs	
	8.3	Map Reading: Map components, Map information, Map setting, Position finding, Map interpretation	
	8.4	Map update: principle and methods	
Unit 9:		Measurement Errors	[8 hrs]
	9.1	Introduction to Theory of error	
	9.2	Significant figure and rules	
	9.3	Sources of errors	
	9.4	Types of Errors	
	9.5	Precision and Accuracy	
	9.6	Laws of accidental error	
	9.7	Propagation of Errors	

Revision and Tests

[8 hrs]

PRACTICAL

Unit 1: Apply Tape and Compass for field work and plotting	[30 hrs]
Unit 2: Measurement of angles using Theodolites by various methods	[30 hrs]
Unit 4: Map reading and updating.	[20 hrs]
Unit 5: Coordinate computation exercise on Map	[10 hrs]

Reference Books

1. *Fundamental of Surveying* by S.K Roy
2. *Surveying volume 1 and 2* by S.K. Duggal
3. *प्रारम्भिक नापी, महेश्वर भट्टराई (त्रि. बि. बि. ÷ पा. बि. के)*
4. *Principles and use of Surveying Instruments*, J. Clendinning, J.G Oliver
5. *Introduction to Surveying*, by Anderson & Mikhail
6. *A Text Book of Advance Surveying*, R. Agor (4th Edition)
7. *Surveying Handbook – Brinker and Minnick*. CBS Publication of India

Computer Application

EG 1221 CT

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

Course objectives:

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

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

Course Contents:

Theory

Unit 1	Introduction to Computers:	[2 hrs]
	1.1 History of computers	
	1.2 Generation and type of computers	
	1.3 Computer hardware and software	
Unit 2	Hardware Components:	[6 hrs]
	2.1 Major blocks of a digital computer	
	2.2 Input devices like keyboard, mouse, joystick, scanner, light pen etc.	
	2.3 Output devices like monitor, printer, plotter, sound card, speaker etc.	
	2.4 Central Processing Unit	
	2.5 Memory Unit: RAM, ROM, PROM, EPROM	
	2.6 Auxiliary storage devices:	
	• Magnetic storage like floppy disk, hard disk, magnetic tape etc.	
	• Optical storage like CD-ROM, DVD	
	• Pen drive, flash memory card etc.	
Unit 3	Introduction to Operating System Software:	[6 hrs]
	3.1 Importance and use of operating systems (OS)	
	3.2 Type of OS: MS-DOS, Windows, Unix, Linux	
	3.3 File management, device management and memory management by OS	
	3.4 MS-DOS system files: io.sys, msdos.sys, command.com, config.sys, autoexec.bat	
	3.5 MS-DOS internal and external commands	
	3.6 Windows Operating System: Graphical User Interface and windows environment, file/folder management	
	3.7 Linux: GNU open source operating system	
Unit 4	Application Packages:	[7 hrs]
	4.1 Text Editors (edit in DOS, notepad in Windows, vi editor in Linux)	
	4.2 Word Processing Package: Microsoft Word	
	4.3 Spreadsheet Package: Microsoft Excel	
	• Entering data	
	• Using formula	

- Basic calculations
 - Financial calculations
 - Charts
- 4.4 Concept of Database management system
- 4.5 Database management package: Microsoft Access
- 4.6 Presentation Package: Microsoft PowerPoint

Unit 5 Utility Programs: [2 hrs]

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

Unit 6 Networks and Internet: [5 hrs]

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

Revision and Test (2 hrs)

Practical

[120 hrs]

1. Identification of major components of computer and familiarization with keyboard and mouse. [3 hrs]
2. Internal and External DOS commands [6 hrs]
3. Windows Graphical User Interface and file/folder management [3 hrs]
4. Microsoft Word [25 hrs]
 - a. Editing text
 - b. Formatting document
 - c. Creating tables
 - d. Creating graphics and word art
5. Microsoft Excel [25 hrs]
 - 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 [25 hrs]
 - a. Creating and manipulating data tables
 - b. Query
 - c. Forms/Reports
7. Microsoft Power Point ; Creating effective presentation using Microsoft PowerPoint [12 hrs]
8. Using Multimedia and Internet/Email [03 hrs]
9. Project Work [18 hrs]

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	EG2101SH	Applied Mathematics
2	EG2101GE	Fundamental of GIS
3	EG2102GE	Control Survey
4	EG2103GE	Cartography
5	EG2104GE	Computer Aided Drafting

Applied Mathematics

EG 2101 SH

Year: II
Semester: III

Total: 4 hour /week
Lecture: 4 hours/week
Tutorial: hours/week
Practical : 0 hours/week
Lab : 0 hours/week

Course Description:

This course includes fundamental of group theory, application of derivatives, differential equations, numerical integration, Trigonometry and basic Geometry.

Course objectives

On completion of this course students will able to

- Discuss group as algebraic structure and establish simple results on finite and infinite groups.
- Prove some theorems and some properties of groups.
- Discuss Geometrical Interpretation of Tangent and Normal.
- Derive equation of Tangent and Normal on curves.
- Define differential equations and different forms of solutions and use in application.
- Evaluate integrals by trapezoid and Simpson's rules.
- Use of sin law and cosine law in the field of surveying .

Course contents

Unit -1 Elementary group theory

[10 hrs]

- a. Binary operation ,
- b. Binary operation on sets of integers and their properties,
- c. Definition of a group
- d. Uniqueness of identity, uniqueness of inverse ,
- e. Cancellation law ,
- f. Abelian group.

Unit -2 Application of derivatives

[8 hrs]

- 2.1 L-Hospital rule (for $0/0$, ∞/∞),
- 2.2 Differentials, tangent and normal ,
- 2.3 Geometric interpretation and application of Roll's theorem and Mean value theorem.

Unit -3 Differential equation

[8 hrs]

- 3.1 Differential equation and its order and degree,
- 3.2 Differential equations of first order and first degree,
- 3.3 Differential equations with separable variables,
- 3.4 Homogeneous and exact differential equations

Unit – 4 Computational Method

[8 hrs]

- 4.1 Solution of linear equations by Gauss elimination method,
- 4.2 Normal Equations and Determination of most probable value .

Unit -5 Numerical Integration

[8 hrs]

- 5.1 Introduction
- 5.2 Definite Integral and Area Computation
- 5.3 Trapezoidal Rule
- 5.4 Estimation of Errors
- 5.5 Simpson's rules
- 5.6 Estimation of errors

Unit -6 Statistics

[5 hrs]

- 6.1 Measure of Dispersion (Standard Deviation and Coefficient of Variation)

6.2 Normal distribution	
Unit – 7 Spherical Trigonometry	[8 hrs]
7.1 Spherical triangle	
7.2 Properties of spherical triangle	
7.3 Spherical excess	
7.4 Solution of spherical triangle; Sine and Cosine Rule	
7.5 Napier’s Rule	
Test and Revision	[5 hrs]

Reference books

1. Higher Secondary Level Mathematics Vol II by Bajrachara B.C. RM Shrestha , Sukunda Pustak Bhawan
2. Element of mathematics Part II, D.B Adhikari , Himalaya Books Stall

Fundamental of Geographic Information System (GIS)

EG 2201 GE

Year: II
Semester: III

Total: 8 hrs/week
Lecture: 4 hrs/week
Tutorial: hrs/week
Practical: 4 hrs/week

Course Description:

The primary objective of this course is to impart fundamental concepts of Database Management system and Geographical Information System. This course aims to introduce various applications of GIS and related technologies in Survey Engineering field. This course focus on practical approach in handling spatial and attribute data for spatial problem solving.

Course Objectives:

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

- Understand concept of database management system and design simple databases.
- Understand the basic concept of GIS and its applications in various fields
- Operate GIS software for handling spatial and attribute data.
- Prepare data for GIS operation
- Perform basic queries in databases
- Prepare result maps

Course Contents:

Unit 1: Database Management System

[8 hrs]

1.1 Introduction to Database Management System

- Data, information & Knowledge
- Databases and databases management system (DBMS)
- Component of database management system
- Define: tables, form, Query, relationship, reports
- Various DBMS softwares

1.2 Logical Data concept and Relationships

- Logical data concept :entities, data value, field/ attribute, records and relationships
- Types of relationships (one to one, one to many, many to many)
- Tables and field data types
- Primary key, candidate key and foreign key

1.3 Data models and DBMS applications

- Relational Data Model & types
- Importance and use of Database Management System (DBMS)
- Benefits of DBMS compared to file system

Unit: 2 GIS and Spatial Data Models

[14 hrs]

2.1. Introductions to GIS

- Geographic phenomena
- Definition of GIS,
- Component of GIS (Hardware, Software, People, Data, Method)
- Stages of GIS workflow (Data Preparation/ Acquisition, Data storage & Management, Data Analysis, and Visualization)
- Spatial and non-spatial data, Relation, tuple & attribute.
- Application area of GIS
- Various types of GIS users

2.2. Spatial Data Models

- Vector Data Model
 - ☞ Define Vector Data Models
 - ☞ Define Scale
 - ☞ Various vector file formats
 - ☞ Introduce Geometry types of vector data (Point, Line & Polygon)

- ☞ Various applications of vector data model
- ☞ Advantages and disadvantages of vector data model
- Raster data Model
 - ☞ Define Raster Data Models
 - ☞ Resolution of raster dataset
 - ☞ Make familiar with file format of Raster data
 - ☞ Introduce the raster data structure (Grid Cells): Regular and Irregular Tessellation
 - ☞ Applications of vector data models
 - ☞ Advantages and disadvantages of the use of Vector data model
- TIN Data Models
 - ☞ Define TIN data model
 - ☞ Data Structure of TIN model
 - ☞ Applications of TIN data model

Unit: 3 Spatial Data Acquisition and Preparation

[14 hrs]

3.1 Sources of Spatial Data

a. Primary Data Sources

- Field base technique: Total Station, GPS, DGPS, Plane Table etc.
- Air-based Technique: Photogrammetry, UAV
- Space based Technique: Remote Sensing

b. Secondary Data Sources

- Existing paper maps (Base and thematic maps)
- Data available in Web (Clearinghouse and online sources)

3.2 Data Entry and Data Preparation

- Map scanning process & Scanning Resolution
- Geo-referencing and map projection (Coordinate system)
- Process of map Digitization (manual, semi-automatic and automatic)
- Process of inserting attribute data in digitized data
- Create attribute data of digitized features
- Checking and repairing Geometry of spatial data
- Data Topology and topological rules

Unit: 4 GIS Operations and Map composition

[14 hrs]

4.1 Querying Databases

- Define querying database
- Understand structure of query language (SQL)
- Define and explain The terms: attribute query, Spatial query (location based query)
- Differentiate Spatial and database query

4.2 Overlay Operation and Geo-processing

- Define and explain following overlay operation with examples
 - Clipping
 - Intersection
 - Union
 - Merge
 - Dissolve

4.3 Result dissemination

- Output map preparation
- Map symbolization
- Map design and map elements

Test and Revision

[10 hrs]

Practical

Unit: 1 Database Management System

[10 hrs]

1.1 Working with Existing databases

- Explore Existing Databases
- Understand the information stored in existing database
- Understand relationships
- Querying existing database (simple query)
- Querying database using logical operators
- Generate reports

1.2 Database Design

- Draw database schema
- Design database tables (design view, Datasheet views),
- Establish relationships among database tables
- Querying database

Unit 2: Exploring spatial data and data preparation

[10 hrs]

2.1 Exploring Spatial Data using GIS software

- Familiarize with GIS software using existing data
- View Layer Properties
- Off/On/ remove data layers
- View and understand attribute table
- Change Symbology& Color
- Label features
- Navigate digital maps (Zoom In/Zoom out, Fixed Zoom in/ Fixed Zoom out, Panning)
- Selection and Export of spatial data
- Define data layers

2.2 Geo-referencing & Map Projection

- Geo-reference scanned maps/ images
- Define projection system (Local and Global system)
- Transform one projection to other (coordinate transformation)

Unit: 3 Creating data layers and table operation

[10 hrs]

3.1 Creating Layer (Features)

- Explore data in software
- Create Vector layers (point, line polygon)
- Metadata view and preparation

3.2 Table Operations

- Attribute table: add remove data
- Relate and join tables
- Add/ remove fields
- Use of field calculator /Field Calculation
- Summarize Attribute table
- Calculate Geometry (Area, Length, and position)
- Export tables

3.3 Digitization

- Digitize raster map/ Satellite image
- Check and edit topology
- Add Attribute information in digitized data

Unit: 4 Query and Overlay Operation

[10 hrs]

4.1 Querying Databases

- Perform Attribute query
- Perform location query (spatial query)

4.2 Overlay Operation

- Perform following Overlay operation

- Clip
- Intersection
- Union
- Merge
- Buffer / Multi ring buffer

Unit: 5 Visualization

[10 hrs]

- Map visualization process
- Layout preparation (legends, heading, North arrow, scale)
- Export maps indifferent formats (Pdf, Jpeg)
- Print maps (page setting)

Test and Revision

[10 hrs]

References:

1. An Introduction to Geographical Information System - Ian Heywood, Sarah Cornelius, Steve Carver, Pearson Education Publication: Pearson Education (Fourth Edition) 2005
2. Principles of Geographic Information System - Rolf A. de By (ed.) (ITC Education Text Book Series; 1)
3. GIS for Beginners - B. Shrestha, B. Bajracharya, Sushil Pradhan (ICIMOD)
4. Principles of Geographical Information System, Peter. A. Burrough and Rachael A. McDonnell (4thEdition)

Control Survey

EG 2102 GE

Year: II
Semester: III

Total: 18 hrs/week
Lecture: 6 hrs/week
Tutorial: hrs/week
Practical: 12 hrs/week

Course Description:

This subject deals with methods of establishing horizontal and vertical controls, Levelling, Traversing, Triangulation, Trilateration, Resection and Intersection, which are the fundamental techniques to establish and densification of control points in geodetic as well as engineering survey works.

Course Objectives:

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

1. Explain the concepts of the control surveying and apply in the field of Surveying and Geomatics.
2. Understand and use different types of levelling techniques for establishing vertical control points and heighting.
3. Understand and use theodolite traversing techniques for establishing horizontal control points.
4. Establish Triangulation network and use trilateration methods for establishing horizontal controls.
5. Distinguish among different technique of establishing control points.
6. Understand different sources of error and their adjustment in leveling, traversing, triangulation, trilateration, etc.

Course Contents:

Theory

Unit 1: Levelling

[25hrs]

1.1 Introduction

- 1.1.1. Introduction & Principle of leveling
- 1.1.2. Definitions of terms: Level, Levelling, level surface, level line, datum, MSL, RL, BM (PBM & TBM), HI, BS, FS, IS, Turning point, Horizontal plane, Horizontal line, Elevation, Altitude, Vertical plane, Vertical line
- 1.1.3. Levelling instruments and accessories

1.2 Methods of Levelling

- 1.2.1 Classification of Levelling: Spirit, Barometric, Hydrostatic, Trigonometric, Hypsometric, GPS
- 1.2.2 Methods of leveling: Simple Levelling, Differential Levelling, Check Levelling, Fly Levelling, Reciprocal Levelling, Precise Levelling, Profile Levelling, Cross Sectioning

1.3 Field Procedure

- 1.3.1 Testing *levels* and Checking collimation error
- 1.3.2 Field Procedure: Reconnaissance, Monumentation, Observation, Recording, Computation
- 1.3.3 Precautions to be taken in the field

1.4 Errors and adjustment in Levelling

- 1.4.1 Types of error
- 1.4.2 Sources of error
- 1.4.3 Permissible error in different order of levelling
- 1.4.4 Adjustment

Unit 2: Traverse

[25hrs]

2.1 Introduction

- 2.1.1 Introduction to Traverse,
- 2.1.2 Definition of terms
- 2.1.3 Principles of traversing
- 2.1.4 Different orders of traverse and their use

2.2 Method of traversing

- 2.2.1 Chain, Compass, Plane Table Traverse
- 2.2.2 Stadia Traverse and Theodolite Traverse
- 2.2.3 Traverse Route: Open and Closed

2.3 Field procedure

- 2.3.1 Field operation: Reconnaissance, Monumentation, and Signaling, Selection of Traverse Station, Types of Monumentation, Construction of monument, D-Cards, Traverse Chart/ Sketch,
- 2.3.2 Angle measurement: Horizontal angles, zenithal/vertical angle, bearing computation
- 2.3.3 Distance Measurements: Distance Measurement by Tapes, Subtense Bar, Stadia Method, and E.D.M,
- 2.3.4 Recording, Computation and Plotting

2.4 Error and Adjustment in Traverse

- 2.4.1 Types of error
- 2.4.2 Sources of error
- 2.4.3 Standard and Specification
- 2.4.4 Traverse Adjustment by Bowditch, Transit, Graphical,
- 2.4.5 Precaution to be taken in field

Unit 3 Triangulation

[25hrs]

3.1 Introduction

- 3.1.1 Definition
- 3.1.2 Purpose
- 3.1.3 Scope
- 3.1.4 Classification of Triangulation Network
- 3.1.5 Different Orders of Triangulation and their Specifications
- 3.1.6 Types of Figure
- 3.1.7 Strength of Figure
- 3.1.8 Types of Control Points

3.2 Field Procedure

- 3.2.1 Reconnaissance and Monumentation (Planning of Network and Control Points, Layout of Network on Map, Intervisibility Calculation, Selection of Station, Chart Preparation, Types of Monumentation, Construction and Design of Monuments, Description Card and Care and Maintenance of Monuments)
- 3.2.2 Signals (Different Types of Signals, Choice of Signals, Observation Tower, Method of erecting Signals and Care and Maintenance of Signals),
- 3.2.3 Observation and Recording (Observation of Horizontal and Zenithal/ Vertical Angles, Distance Measurements, Recording the observation, Satellite stations, Triangular Misclosure)
- 3.2.4 Computation and adjustment(Compilation of Forms and Tables, Different Formulae used for Computation, Computation of Difference of Easting and Northing, Adjustment of Triangulation Network, Difference in Height by Vertical Angles, Height Misclosure and Correction and Height of Station)

3.3 Error and Adjustment in Triangulation

- 3.3.1 Types of error
- 3.3.2 Sources of error
- 3.3.3 Standard and Specification
- 3.3.4 Error adjustment and Accuracy Assessment
- 3.3.5 Precaution to be taken in field

Unit 4 Trilateration

[6hrs]

- 4.1 Definition and Principles
- 4.2 Purpose and Scope
- 4.3 Field Operation (Reconnaissance, Monumentation, Signaling, Observation, Recording, Computation and Adjustment)

Unit 5 Resection and Intersection

[6hrs]

- 5.1 Definition and Principles
- 5.2 Purpose and scope
- 5.3 Field Operation (Reconnaissance, Monumentation, Signaling, Observation, Recording, Computation and Adjustment)
- 5.4 Precautions to be taken

Unit 6 Test and Revision

[3hrs]

Practical

LEVELLING PRACTICAL

[64 hrs]

Field work

Unit 1: Collimation Checking

Unit 2: Reconnaissance and Benchmark Establishment

Unit 3: Levelling field work (Different methods)

Unit 4: Computation and plotting of profiles

Unit 5: Cross-section and Profile

Unit 6: Reciprocal Levelling

TRAVERSE SURVEY

[60 hrs]

Field work

Unit 1: Instrument Checking

Unit 2: Reconnaissance and Monumentation

Unit 3: Theodolite/total station Traverse (open and closed loop)

Unit 4: Computation, adjustment and plotting

TRIANGULATION SURVEY

[24 hrs]

Field work

Unit 1: Instrument Checking

Unit 2: Reconnaissance and Monumentation

Unit 3: Observation, Recording

Unit 4: Computation and adjustment

TRILATERATION

[16hrs]

INTERSECTION AND RESECTION

[16hrs]

Reference Books

1. *Surveying (Volume 1 and 2) by Dr. K.R. Arora: Rajons Publication Pvt. Ltd.*
2. *Surveying (Volume 1 and 2) by Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain: Laxmi Publication (P) Ltd.*
3. *The Text book of Surveying & Levelling, by R. Agor*
4. *Levelling Instruction Book, Survey Department of Nepal*
5. *Tringulation Instruction Book, Survey Department of Nepal*

Cartography

EG 2103 GE

Year: II
Semester: III

Total: 6 hrs/week
Lecture: 4 hrs/week
Tutorial: hrs/week
Practical: 2 hrs/week

Course Description:

This subject consists of fundamental principles and techniques of map making and map reproduction.

Course Objectives:

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

1. Understand the concept of Cartography
2. Apply the Conventional Cartographic Process in map making
3. Explain different aspects of Cartography
4. Understand Map Sheet Numbering System of Nepal
5. Apply the techniques of Map Reproduction and Printing
6. Understand the concept of Digital Cartography

Course Contents:

Unit 1	Introduction	[4hrs]
	1.1. Definition	
	1.2. History of Cartography	
	1.3. Scope and uses of Cartography	
Unit 2	Map	[6hrs]
	2.1. Definition	
	2.2. Types of Map and Classification of Maps	
	2.3. Map Scale	
	2.4. Introduction to Drawing and Scribing	
	2.5. Semiology	
	2.6. Map Design and Layout	
	2.7. Typonomy and Typography	
	2.8. Enlargement and Reduction of Map	
	2.9. Uses of Map	
Unit 3.	Branches of Cartography	[10hrs]
	3.1. Map Compilation	
	• Steps of Map Compilation	
	• Method of Compilation for Base Map, Derived map and Special Purpose (Thematic) Map	
Unit 4.	Graphic Variables	[3hrs]
	4.1. Definition	
	4.2. Importance of Graphic Variables	
	4.3. Concept of Visual Perception	
	4.4. Types of Graphic Variables	

- Unit 5. Map Projection** [8hrs]
- 5.1. Introduction
 - 5.2. Classification of Map Projection
 - 5.3. Map distortion and Scale Factor
 - 5.4. Choice of Map Projection
 - 5.5. Universal Transverse Mercator (UTM) Projection
 - 5.6. Modified Universal Transverse Mercator (MUTM) Projection & Grid System used in Nepal
- Unit 6. Map Sheet Numbering** [8hrs]
- 6.1. Introduction
 - 6.2. Map Sheet Numbering for Topographic Maps in Nepal
 - Small scale
 - Large Scale
 - 6.3. Map Sheet Numbering for Cadastral Maps in Nepal
- Unit 7. Generalization** [4hrs]
- 7.1. Definition
 - 7.2. Different Aspects of Generalization
 - 7.3. Some Directives for Generalization
 - 7.4. Exaggeration
 - 7.5. Displacement
 - 7.6. Different Methods of Generalization
- Unit 8. Relief Representation** [4hrs]
- 8.1. Definition of Relief
 - 8.2. Importance of Relief Representation in Maps
 - 8.3. Methods of Relief Representation
 - Spot Height
 - Hachuring
 - Contouring
 - Hill Shading
 - Layer Tinting
 - 3D Models
 - 8.4. Rock Drawing
- Unit 9. Colour** [3hrs]
- 9.1. Introduction
 - 9.2. Nature of light
 - 9.3. Additive and Subtractive Colours
 - 9.4. Colour Triangle
 - 9.5. Choice of Colours (Colour Charts)
- Unit 10. Digital Cartography** [6hrs]
- 10.1. Introduction
 - 10.2. Raster and Vector Data Model
 - 10.3. Steps of Digital Method of Map Making
 - 10.4. Difference between Conventional and Digital Cartography
 - 10.5. Digital Landscape Model (DLM) and Digital Cartographic Model (DCM)

Unit 11. Map Reproduction

- 11.1 Introduction
- 11.2 Terms used in map reproduction: Positive, Negative, Dia-positive, Tone, Screen and Film
- 11.3 Contact Photography
- 11.4 Camera Photography
- 11.5 Diazo Reproduction
- 11.6 Open Window Mask
- 11.7 Plate Making Process (Positive and Negative System and Digital Plate Making System)
- 11.8 Quality Control (Colour Proof and Registration)
- 11.9 Map Printing: Flat Bed Printing, Rotary Offset Printing and Digital Printing

12. Revision and Test/Exam

[4hrs]

Practical

1. Prepare Layout in A4 size Paper for Cadastral Map Sheet [4 hrs]
2. Prepare Layout in A4 size Paper for Topographic Map Sheet [4 hrs]
3. Identify and List the different Visual Variables in the Topographic Map of Nepal [2hrs]
4. Show the Sheet Numbering System of Topographic Map of Nepal [4 hrs]
5. Show the Sheet Numbering System of Cadastral Map of Nepal [8 hrs]
6. Generalize the boundary of given District/ Municipality Polygon [4 hrs]
7. Observation for Colour Separation Sheets (2' 30" X 2' 30" Topographic Map; Four Colours) for Plate Making [2 hrs]
8. Map Reproduction and Printing Process: Observation of Map Printing Press [2 hrs]

Reference Books

1. *Elements of Cartography*, H. Rabison
2. *Cartography for Mapping*, Rabin Kaji Sharma
3. *Cartography Visualization of Geospatial Data*, Menno Kraak & Ferhan Ormeling
4. *Basic Cartography Vol I*, International Cartographic Association
5. *Lecture Notes on Cartography*
6. *Triangulation Instruction Book*, Survey Department
7. *Cartography*, ITC Publication, 1970, L. Van Zuylan and J. W. Shearer

Computer Aided Drafting (CAD)

EG 2104 GE

Year: II
Semester: III

Total: 4 hours /week
Lecture: hours/week
Tutorial: hours/week
Practical: 4 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 geomatics engineering drawing. This course is an intensive introduction to the use of a Computer Aided Design and Drafting (CADD) system for the development of construction/survey drawing, mapping 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
2. To create base map from point data, create basic Civil and Architectural drawings

Course contents:

Unit 1: Starting a New Drawing/ Opening an existing drawing [3 Hours]

- 1.1. Setting up a drawing starting from scratch, using a Wizard, using and creating a template file, draftingaids.
- 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 [15 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 (mold line & single line / true type fonts)
- 2.7. Dimensions

Unit 3: Modify Commands [10 Hours]

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

Unit 4: Features [4 Hours]

- 4.1. Layers concept, match and change properties.
- 4.2. Measure and divide
- 4.3. Inquiry commands

- 4.4. Model Space View/ports and Template Drawings
- 4.5. Uses of Script tiles
- 4.6. Drawing Exchange (convert to other format from drawing format and into drawing format)

Unit 5: Use of AutoCAD and LD in Geomatics Engineering Field [20 Hours]

- 5.1. Create projects.
- 5.2. Plot a co-ordinates from a file and create point group.
- 5.3. Create a layers of different properties from point groups.
- 5.4. Contour plotting with the help of points.
- 5.5 Create alignment, profile and cross section
- 5.6 create a map and connect a shapefile to LD.

Unit 6: Plotters and plotting the drawing in different scale [6 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	EG2201GE	Fundamental of Social Science
2	EG2202GE	Photogrammetry
3	EG2203GE	Remote Sensing
4	EG2204GE	Topographic Survey
5	EG2211CT	Basic Computer Programming

Fundamental of Social Science and Environment

EG 2201 GE

Year: II
Semester: IV

Total: 4 hours /week
Lecture: 4 hours/week

Course Description:

This subject consists of nine units related to Society, Community Development and Environment necessary to develop background in Social Science and Environment that supports for the understanding and practicing the related engineering works.

Course Objectives:

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

5. Explain the basic concept related to the society, social change, challenges to Nepali society and governance system in Nepal; and apply it in the field of the related engineering areas.
6. Explain the basic concept related to community development and apply it in the field of the related engineering areas.
7. Explain the basic concept related to environment, disaster risk management and climate change; and apply it in the field of the related engineering areas.

Course Contents:

Unit 1: Introduction to Society	6hrs.
1.1 Concept of Society	
1.2 Essential Elements of Society	
1.3 Types of Society	
1.4 Elements of A Good Society	
Unit 2: Process of Social Change and Integration	6 hrs.
2.1. Meaning of Social Change	
2.2. Theories of Social Change: Linear, Cycle and Contemporary	
2.3. Causes of Social Change	
2.4. Concept of Social Integration	
Unit 3: Challenges to Nepali Society	8 hrs.
a. Poverty and Underdevelopment	
b. Authoritarianism	
c. Unemployment	
d. Conflict	
e. Corruption	
f. Morality and Ethics	
g. Solutions of Challenges to Nepali Society	
Unit 4: Basics of Governance System in Nepal	8 hrs.
4.1. Elements of Good Governance	
4.2. Salient features of Constitution of Nepal 2072	
4.3. Structure of State and Distribution of State Power	
4.4. Fundamental Rights and Duties	
4.5. Executive, Legislature and Judiciary in all level	
Unit 5: Community Development	6 hrs.
a. Concept of Community Development	

- b. Stages of Community Development
- c. Sustainable Development and Human Development
- d. Environment & Development

Unit 6: Resource Mobilization for Community Development **8 hrs.**

- 6.1. Local Resources: People, Institutions, Knowledge, Technology, Natural Resources,
- 6.2. Relationship
- 6.3. Institutions/ local organizations and their mobilization
- 6.4. Exploration of new resources for effective management: - local products, Technologies, Institutions
- 6.5. External Resource Management

Unit 7: Environment Protection **6 hrs.**

- 7.1. Meaning of Environment and Ecology
- 7.2. Elements and types of Environment
- 7.3. Need and Importance of Environment Protection
- 7.4. Major ways of Environment Protection

Unit 8: Disaster Risk Management **4hrs**

- 8.1 Disaster terminologies: Hazard, Disaster, Risk, Vulnerability, Capacity, Resilience
- 8.2 Nepal: A Disaster Hotspot (Flood, Landslide, Epidemics, Fire, Earthquake, Climate Change, Glacier lake outburst flood)
- 8.3 Disaster Management Cycle: from Response to Reduction

Unit 9: Climate Change **4hrs**

- 9.1 Understanding the Climate Change and its impacts
- 9.2 Basic ideas of Climate Change Adaptation
- 9.3 Basic ideas of Climate Change Mitigation

Test and Revision **4hrs**

References

1. Shrestha, Harikrishna & Rout , Mohan Kumar 2017, **Contemporary Society**, Highland publication ,Bhotahity, Kathmandu.
2. अधिकारी देवबहादुर र भट्टराई डा.घनश्याम (२०६४) **समकालीन नेपाली समाज** ,आठराई प्रकाशन
3. रेग्मी कमलराज, शर्मा देवी, आधारभूत समाजशास्त्र तथा मानवशास्त्र
4. Bhattachan,K and C.Mishra, **Development Practices in Nepal**,1996, T.U. Kathmandu
5. Shrestha, Maheshwar Man,2058, **Nepal's Development Experiences; An Evaluation**, Akshalok Prakashan, Kathmandu
6. **The Constitution of Nepal 2072**
7. *Sharma, Rabin K. Mapping My Professional Journey (Collection of Articles from the Author), 2069,Kathmandu.*
8. Environment Protection Act, 2053
9. [Environment Protection Rules, 2054](#)
10. [Climate Change Policy 2067](#)
11. [Climate Change - Fact Sheet in Nepali](#) Climate Change Network Nepal (CCNN)
12. **Notes on Climate Change impacts and Adaptation & Mitigation Strategies**, Khadga Sen Oli
13. Sendai Framework for Disaster Risk Reduction (SFDRR) 2015
14. *Environmental Resource Management in Nepal/U. M. Malla, C. B. Shrestha*

Photogrammetry

EG 2202GE

Year: II
Semester: IV

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

Course Description:

This subject consists of **Eight units** related to Photogrammetry necessary to familiarize students on elementary knowledge of Photogrammetry helpful for the understanding and practicing the related engineering works.

Course Objectives:

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

5. Define Terminologies of Photogrammetry
6. Understand Aerial camera and scale of the photograph
7. Apply Stereoscopic vision techniques
8. Understand Different photogrammetric equipment
9. Apply Techniques of aerial triangulation
10. Recognize the features in the aerial photograph
11. Apply Method of photo mosaic and its use
12. Apply Procedure of mapping by photogrammetric method
13. Understand Digital Elevation Model Generation

Course Contents:

- | | |
|--|----------------|
| Unit 1. Introduction | [8 hrs] |
| 1.1. Definition of Photogrammetry | |
| 1.2. History of Photogrammetry | |
| 1.3. Classification | |
| 1.4. Projection and the properties of Orthogonal and Perspective Projections | |
| 1.5. Definition of related Terminologies | |
| • Fiducial Marks | |
| • Fiducial Axis | |
| • Nadir Point | |
| • Principal Point | |
| • Perspective Centre | |
| • Focal Length | |
| • Principal Distance | |
| • Camera axis | |
| • Principal Axis | |
| • Principal Plane | |
| • Principal Line | |
| • Photo Plane | |
| • Isocentre | |
| • Homologous Points | |
| • Tilt | |
| • Format of Photograph | |
| 1.6. Components of Photogrammetry | |
| 1.7. Scope of Photogrammetry in Survey Profession | |
| 1.8. Comparison of Aerial Photograph and Map | |
| Unit 2. Aerial Photography | [9 hrs] |
| 2.1. Basic concepts and types of aerial camera | |
| 2.2. Essential parts of an aerial camera | |

- 2.3. Types of lens used in Aerial Camera
 - Narrow Angle,
 - Normal Angle
 - Wide Angle
 - Super Wide Angle
 - 2.4. Types of Aerial Photographs and its uses:
 - Vertical
 - Oblique: Low oblique and high oblique
 - 2.5. Aerial Photographic process
 - 2.6. Derivation of the formula for Scale of Vertical Aerial Photograph
 - 2.7. Determination of Scale of a Photograph
 - 2.8. Relief Displacement and Derivation of formula of relief displacement
 - 2.9. Tilt Displacement
 - 2.10. Related Terminology:
 - Overlap : Forward and Lateral
 - Drift and Crab
- Unit 3. Stereoscopy** **[9 hrs]**
- 3.1. Stereoscopic Vision and conditions for viewing stereoscopic vision
 - 3.2. Parallax
 - 3.3. Process for Orientation of Pair of Photographs
 - 3.4. Methods for Stereoscopic Viewing using the following techniques
 - Pocket and Mirror Stereoscope
 - Anaglyph System
 - Modern Methods
 - 3.5. Orientation Elements of a photograph and their motion
 - 3.6. Stereo restitution
 - Inner orientation
 - Exterior orientation: Relative and Absolute orientation
- Unit 4. Introduction to Photogrammetric Instruments** **[8 hrs]**
- 4.1. Background
 - 4.2. Point Transfer and Image Matching techniques
 - 4.3. Technical features for the following Photogrammetric instruments:
 - Stereo Plotters
 - Optical Projection Plotter
 - Mechanical Projection Plotter
 - Analytical Plotters
 - Digital Photogrammetric workstation
 - 4.4. Rectifier and process of Rectification
- Unit 5. Aerial Triangulation** **[8 hrs]**
- 5.1. Introduction
 - 5.2. Purpose of Aerial Triangulation
 - 5.3. Principle of Aerial Triangulation
 - 5.4. Projective Relation between Photo and Ground Coordinate System
 - 5.5. Spatial Triangulation Methods
 - Aero-polygon Triangulation
 - Independent Model Triangulation
 - Analytical Triangulation
- Unit 6. Photo Interpretation** **[3 hrs]**
- 6.1. Introduction
 - 6.2. Elements of Photo interpretation
 - 6.3. Recognition of topographical features on the photographs
- Unit 7. Photogrammetric Procedure** **[6 hrs]**
- 7.1 Elements of Photogrammetric mapping
 - 7.2 Introduction to Digital Elevation Model (DEM)
 - 7.3 Process of DEM generation

7.4	Ortho Rectification and the process of orthophoto production	
7.5	Mosaic	
7.6	Photo index	
7.7	Difference between aerial photo and orthophoto	
7.8	Feature extraction	
Unit 8.	Unmanned Aerial Vehicle (UAV)	[4 hrs]
8.1.	Introduction	
8.2.	Application Areas	
Revision and Test		[5 hrs]

Practical

Unit 1:	Introduction	[10 hrs]
1.1	Practice Stereoscopic Vision Using Pocket Stereoscope	
1.2	Mark Principal Points in the Photographs	
1.3	Practice Transfer of points on Adjacent Photographs using Mirror Stereoscope	
1.4	Draw Principal Lines in the Photographs	
Unit 2:	Some Measurements	[10 hrs]
2.1	Calculate Scale of the Photograph	
2.2	Calculate Area of Photograph	
2.3	Determine effective area of a Photograph	
Unit 3:	Exercise on Aerial Photographs	[20 hrs]
3.1	Measure Forward and Lateral Overlap of the photographs	
3.2	Prepare a Photo Mosaic	
3.3	Identify Selected Features on Aerial Photograph	
Unit 4:	Exercise on Digital Photogrammetry	(20hrs)
4.1	Get acquainted with digital photogrammetric workstation	
4.2	Interior orientation- Demonstration	
4.3	Exterior Orientation- Demonstration	
4.4	Aerial Triangulation - Demonstration	
4.5	DTM Generation- Demonstration	
4.6	Ortho-photo Production- Demonstration	
4.7	Feature Extraction- Demonstration	

REFERENCES

1. Elements of Air Survey, W. K. Kilford
2. Lecture Note on Photogrammetry, School of Geomatics
3. Manual of Aerial Photography: ISPRS Publication
4. Manual of Photogrammetry: ISPRS Publication
5. Surveying (Field Astronomy and Photogrammetric Surveying) Volume III, B. C. Punmia

Remote Sensing

EG 2203 GE

Year: II
Semester: IV

Total: 8 hour /week
Theory: 4 hours/week
Lecture: hours/week
Practical: 4 hours/week

Course Description:

This course is designed for the students pursuing diploma in Geomatics Engineering. The course covers the fundamental concept of remote sensing

Course Objectives:

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

- Understand the basic concepts of remote sensing Principles
- Explore and interpretation the satellite images
- Perform the simple operation with remotely sensed data
- Conceptualize the application of Remote sensing data
-

Unit 1: Introduction to Remote Sensing (6 hrs)

- 1.1. Definition
- 1.2. Components of Remote Sensing
- 1.3. Applications, advantages and limitations of Remote Sensing

Unit 2: EMR interaction with Atmosphere and Earth Materials (12hrs)

- 2.1 Electro Magnetic Radiation (EMR)
- 2.2 EMR spectrum
- 2.3 Atmospheric characteristics
- 2.4 Atmospheric Scattering: Rayleigh, Mie & Non-selective
- 2.5 EMR Interaction with Water vapor and ozone
- 2.6 Atmospheric Windows
- 2.7 Significance of Atmospheric windows
- 2.8 EMR interaction with Earth Surface Materials
- 2.9 Radiance, Irradiance, Incident, Reflectance
- 2.10 Absorbed and Transmitted Energy Reflectance
- 2.11 Specular and Diffuse Reflection Surfaces
- 2.12 Spectral Signature curves
- 2.13 EMR interaction with water, soil and Earth Surface

Unit 3: Sensor and platform (8 hrs)

- 3.1 Platforms
- 3.2 Passive and Active sensors
- 3.3 Resolution: Spatial, Spectral, Radiometric and Temporal
- 3.4 Satellite Orbits
- 3.5 Orbit Parameters
- 3.6 Types of satellite orbits
- 3.7 Some operational multispectral sensors

Unit 4: Pre-processing (10 hrs)

- 4.1 Image Enhancement
- 4.2 Visualization of image data
- 4.3 Histogram and histogram operations
- 4.4 Filtering
- 4.5 Radiometric distortion and corrections
- 4.6 Geometric distortion and correction

Unit 5: Image analysis**(14 hrs)**

5.1 Visual Image Interpretation of Satellite Images

5.2 Digital Image Classification

5.2.1 Principles of image classification: Image Space, Feature Space, Distances and clusters in the feature space

5.2.2 Image Classification techniques

5.2.3 Pixel based classification: Unsupervised and supervised

5.2.4 Accuracy assessment

5.2.5 Validation of the result

Test and Revision**(10 hrs)****Lab Exercise****(60 hrs)**

1. Observation of image and reading pixel data
2. Observe image bands of multi spectral images
3. Image Subsetting
4. Mosaic images
5. Image Enhancement
6. Stacking layers and prepare multi spectral images
7. Geo-reference satellite image
8. Digital Image Classification and Accuracy Assessment

Text Book

B. Bhatta, Remote Sensing and GIS, Oxford University Press, 2010. (Unit 1, 2, 5, 7, 9 & 10).

Topographical Survey

EG 2204 GE

Year: II
Semester: IV

Total: 14 hrs/week
Lecture: 4 hrs/week
Tutorial: hrs/week
Practical: 10 hrs/week

Course Description:

This subject consists of **six** units related to topographical surveying background including graphical and numerical methods 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 basic concepts, principles and methods of topographical surveying both graphically and numerically and apply them in the field of related engineering area.

Course Contents:

Unit 1: Introduction to topographical survey:

[10 hrs]

- 3.1 Define:
 - Topographical survey
 - Planimetric and altimetric detail
 - Natural and artificial feature
 - Contour and contour interval
 - Identify other methods of representing relief
- 3.2 Explain the methods of topographical surveying:
 - Ground survey method
 - Air survey method
- 3.3 Introduction to contour survey: Explain the followings:
 - Factors deciding contour interval
 - Methods of contouring (Direct and indirect methods)
 - Characteristics of contour
 - Uses of contour

Unit 2: Introduction

[5 hrs]

- 1.1. Introduce Graphical surveying and define
 - Planetablin
 - Radial line method in Photogrammetry
 - Plottable error

Unit 3: Process of Plane Table (PT) Surveying

[15 hrs]

- 2.1. Explain the following accessories of Plane Table Survey:
 - Plane Table
 - Alidade: Simple Alidade and Telescopic Alidades (Simple Telescopic alidade and Microptic Telescopic alidade)
 - Plumb bob
 - Plane table Level
 - U-fork
 - Magnetic Compass
 - Clinometer
 - Checking and adjustment of equipment

- Preparation of Plane Table Sheet
- 2.2. Define Control net for PT survey and auxiliary points
- 2.3. Explain the following steps for Setting up for Plane Table Survey
 - Stabilization
 - Centering
 - Leveling
 - Orientation
- 2.4. Explain the following Methods of Plane Tabling
 - Radiation
 - Intersection
 - Traversing
 - Resection: Two point problem and Three point problems (Lehmann's rules, Bessel's method and Tracing paper method)
- 2.5. Define Danger Circle
- 2.6. Explain the following steps of Field work for Surveying details
 - Preparation
 - Reconnaissance
 - Picking details
 - Accessory works
- 2.7. Identify Errors in plane tabling
- 2.8. Identify Advantages and disadvantages of Plane tabling

Unit 4: Numerical Surveying

[10 hrs]

- 1.1 Introduce Numerical Surveying
- 1.2 Explain Principle of Numerical Survey
- 1.3 Explain the Methods
- 1.4 Identify the Uses
- 1.5 Describe in short the following Instruments and accessories used for Numerical survey:
 - Tape,
 - Theodolite,
 - EDM,
 - Total Station and
 - GPS

Unit 5 : Operations of Numerical Survey

[15 hrs]

- 1.1 Explain the following steps of Numerical Survey
 - Preparation for Numerical Surveying
 - Checking and adjustment of equipment
 - Reconnaissance of area specified for survey
 - Diagram of control network
 - Observation
 - Computation and adjustment of data
 - Plotting and drawing

Revision and Test:

[5 hrs]

Practical

1. Indoor

a. Map Compilation

[20 hrs]

2. Outdoor

[130 hrs]

Unit 1: Establishment of Controls for Plane Table

Unit 2: Plane Table Traverse Survey and adjustment

Unit 3: Large Scale Topographical Mapping by Plane Table Survey in the scale of 1:1000/1:500

Unit 4: Planning for Numerical Surveying

- a. Preparation for field work and arrangement of necessary equipment
- b. Organization of field data
- c. Calculation and adjustment
- d. Plotting and drawing
- e. Exercise for calculation of area based on numerical data

Unit 5: Carry out following steps of Numerical Survey in the Field

- 5.1. Reconnaissance
- 5.2. Observation/Data Capture for Topographical/Cadastral/Engineering Mapping (1:500)

Reference Books

1. *The Principles of Surveying*, J. Clendinning and J.G. Olliver, The English Language Book Society (ELBS)
2. *A Text Book of Surveying* C. Venkatramaiah, University Press (India) Limited
3. *Fundamental of Surveying* S.K Roy, Prentice hall of India
4. *Plane Surveying*, David Clark
5. *Surveying volume I, II* S.K. Duggal
6. *Surveying volume I, II* Dr. B.C. Punmia

Basic Computer Programming

EG 2211 CT

Year: II
Semester: IV

Total: 6 hours/week
Lecture: 2 hours/week
Tutorial: hours/week
Practical: 4 hours/week

Course Description:

This course consists of fundamental concept of database management system along with introduction to python programming applicable in geo-informatics field.

Course Objectives:

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

- Understand database management system
- Design methodology for databases and verifying their structural correctness
- Implementing databases primarily in the relational model
- Implement querying languages, primarily SQL, and other database supporting software
- Provide an understanding of python programming in solving problems.
- Develop ability to write small programs.

Course Contents:

Unit 1: Introduction to Database Management System [3hrs]

- 1.1 Data and information
- 1.2 Comparison between file system and computerized database system
- 1.3 Concept of databases & databases management system
- 1.4 Component of database management system
- 1.5 DBMS architecture

Unit 2: Logical Data concept and Relationships [3hrs]

- 2.1 Introduce logical data concept entities: data value, field/ attribute, records and relationships
- 2.2 Introduction to database tables :create, design and modify
- 2.3 Relationship: Relationship in a Database, How relationship work
- 2.4 Explain key field (primary key, candidate key and foreign key)

Unit 3: Data models and DBMS applications [6hrs]

- 3.1 Introduce different types of Relational Data Model
- 3.2 Define object oriented data model
- 3.3 Introduce database language: Data definition language (DDL), Data Manipulation Language (DML)
- 3.4 Introduce physical and conceptual data models
- 3.5 Database modeling process
- 3.6 Process of creating a database table
- 3.7 Query Basics : Types of Queries, Steps for Creating a Query
- 3.8 Working with SQL
- 3.9 Process of database administration

Unit 4: Introduction to Programming Languages [3hrs]

- 4.1 Introduction to programs and programming languages
- 4.2 Low level language

- 4.3 High level language
- 4.4 Program design methodology: Algorithms and flowchart
- 4.5 Stages of Software development: Analysis ,coding testing and debugging, Program documentation etc

Unit 5: Introduction to Python **[13 hrs]**

- 5.1 Installation and Working with Python
- 5.2 Python variables and basic Operators
- 5.3 Python Data Types: integer float complex
- 5.4 Using string data type and string operations
- 5.5 Blocks using if, else and elif
- 5.6 Simple for loops in python
- 5.7 Use of while loops in python
- 5.8 Functions and Modules (Introduction only)

Test and Revision **[2 hrs]**

Practical: **[60 hrs]**

1. Design a Database and create required tables.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER, UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions:
MAX(),MIN(),AVG(),COUNT()
6. Installation and working with Python
7. Develop programs to understand loops in python
8. Develop programs to learn different types of structures in python

References books:

1. H.F Korth and A. Silberschitz, “ *Database System Concepts*” McGraw Hill
2. Gary W. Hansen, James V. Hansen, “*Database Management and Design*” Prentice Hall of India.
3. Elmasri and Navathe , “ *Fundamental of Database Systems*” McGraw Hill
4. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India
5. R. Nageswara Rao,“*Core Python Programming*”, dreamtech
6. Wesley J. Chun. “*Core Python Programming Second Edition*”, Prentice Hall
7. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “*Data Structures and Algorithms in Python*”, Wiley

Third Year

(Fifth and Sixth Semesters)

Fifth Semester

Subjects:

- | | | |
|---|----------|--|
| 1 | EG3101GE | Geodesy and Astronomy |
| 2 | EG3102GE | Basic Construction and Quantity Survey |
| 3 | EG3103GE | Cadastral Surveying |
| 4 | EG3104GE | Land Administration and Land Laws |
| 5 | EG3105GE | Survey Management |

Geodesy and Astronomy

EG 3101GE

Year: III
Semester: V

Total: 6 hours/week
Lecture: 4 hours/week
Tutorial: hours/week
Practical: 2 hours/week

Course Description:

The course content is focused on elementary knowledge on Geodesy, Astronomy and GPS. It includes the application of GPS in surveying and mapping.

Course Objectives:

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

- the basic concept of Geodesy, Astronomy and GPS
- Determine the position and direction using sun and star observation
- Use handheld GPS for data capture

Course Contents:

A. Elementary Geodesy

Unit 1. Figure of the Earth **4hrs**

- 1.1 Shape and Size of the Earth
- 1.2 Spheroid and Geoid
- 1.3 Everest spheroid and its parameters

Unit 2. Coordinate systems **6hrs**

- 2.1 Geographical Coordinates
- 2.2 Rectangular Coordinates
- 2.3 Concept of coordinate conversion: Geographical to rectangular and vice versa

Unit 3. Gravimetry **2hrs**

- 3.1. Introduction Gravity
- 3.2. Terms used in gravimetry
- 3.3. Application area

B. Satellite Geodesy

Unit 4. Global Positioning System **8 hrs**

- 4.1 Introduction to GPS
- 4.2 GPS Segments
- 4.3 GPS orbital parameters
- 4.4 WGS- 84
- 4.5 Principle of GPS Positioning
- 4.6 Absolute and relative Positioning
- 4.7 Static and kinematic modes in GPS Survey
- 4.8 GPS geometry and accuracy
- 4.9 Other Satellite systems

C. Astronomy

Unit 5. Introduction to astronomy **4hrs**

- 5.1 Solar System
- 5.2 Kepler's Laws of Planetary motion

Unit 6. Celestial Sphere **10hrs**

- 6.1 Definitions
- 6.2 Spherical triangle and spherical excess
- 6.3 Application of sine and cosine formulae of spherical trigonometry

- 6.4 System of celestial coordinates
 - Altitude and Azimuth
 - Right Ascension and Declination
- 6.5 Motion of Sun; Equinoxes and solstices, seasons
- 6.6 Astronomical Triangle

Unit 7. Time **8hrs**

- 7.1 Solar Time
- 7.2 Siderial Time, Mean Solar Time and Apparent Time
- 7.3 Conversion to mean Solar Time to Siderial time and Vice versa.
- 7.4 Greenwich Mean Time, Universal time
- 7.5 Local Time, Standard Time
- 7.6 Star Almanac

Unit 8. Astronomical Observations **8hrs**

- 8.1 Determination of Azimuth by Sun observation.
- 8.2 Determination of Latitude, Longitude and Azimuth by star observation,

Test and Revision **10 hrs**

Reference Books

1. *Surveying Volume III, Dr. B.C Punmia, A.K Jain, Laxmi Publication Pvt. Ltd. India*
2. *Surveying Vol. I and II, S.K Duggal, Tata McGraw-Hill Publishing Company Ltd. New Delhi, India*
3. *Engineering Surveying, W. Schofield, Butter Worth, Heinemann*
4. *Triangulation Instruction Book , Geodetic Survey Branch, Nepal*
5. *Fundamental of Surveying, S.K Roy, Prentice –Hall of India, New Delhi*
6. *GPS Theory & Practice, B. Hofmann, J. Collion et al.*

Practical: **[30 hrs]**

1. Solar observation

- 1.1 Observation of Sun for Azimuth determination
- 1.2 Computation of observed data;
- 1.3 Observation of stars for Azimuth determination
- 1.4 Computation of observed data;

2. Global Positioning System

- 2.1 Operate Handheld GPS
- 2.2 Capture positional data
- 2.3 Navigation to point
- 2.4 Tracking routes
- 2.5 Plotting GPS data
- 2.6 Differential GPS (Static and differential positioning -Demo)
- 2.7 Post processing of DGPS- Demo

Civil Construction and Quantity Estimation

EG 3102 GE

Year: III
Semester: V

Total: 6 Hours/week
Lecture: 4 Hours/week
Tutorial: hours/week
Practical: 2 hours/week

Course Description:

This course includes basic introduction of construction materials, Building construction, Road Construction, Irrigation System, Water Supply System, River training works,, Estimating.

Course Objectives:

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

1. Explains the major items of work required for construction
2. Interpret simple road alignment geometry
3. Understand elements of simple irrigation system
4. Understand basics of Water Supply system
5. Explain the different units of measurements used for quantifying the item of construction works
6. Explain the major items of work required for construction like building, irrigation, road, water supply.

Course Contents:

- Unit 1. Introduction** [2 hrs]
1.1 Definition of the construction works
1.2 Principles and Design of construction works
- Unit 2. Construction materials** [6 hrs]
2.1 Types of construction materials
2.2 Characteristics of brick, stones, aggregates, cement, steel and timber
- Unit 3. Building Construction** [6 hrs]
3.1 Buildings elements – Foundation & Superstructure (walls, flooring, roofing, doors and windows)
3.2 Stones masonry – Coursed/Uncoursed, Random Rubble/Ashlar
3.3 Brick Masonry – English Bond, Flemish Bond, Stretcher Bond
3.4 Cement concrete – PCC, RCC
3.5 Formwork
3.6 Plastering / painting.
- Unit 4. Road construction** [6 hrs]
4.1 Classification of roads – National highways, Feeder roads, District roads/Village roads, City roads or streets
4.2 Road geometry – Horizontal and vertical alignments, Cross sectional elements (Camber, super elevation etc), Sight Distance characteristics (Stopping, overtaking sight distances)
4.3 Road pavement – Sub grade, Base, Sub base, Wearing Course
4.4 Structures – Bridge, Culvert, Retaining wall, breast walls)
- Unit 5. Irrigation System** [6 hrs]
5.1 Concept of irrigation system
5.2 Types of irrigation system
5.3 Components of small scale irrigation system
5.4 Water Distribution management
- Unit 6. River training works** [2 hrs]
6.1 Purpose of river training works
6.2 Methods of river training
- Unit 7. Water Supply System** [8 hrs]
7.1 Sources of water
7.2 Discharge measurement by velocity-area method and bucket-stop watch method
7.3 Introduction to and type of water supply system
7.4 Gravity flow water supply system – Intake, Pipeline transmission, distribution, Interruption/ break pressure tank, Valve chambers, Distribution chambers, Reservoir tank, Stand posts
7.5 Pipe and pipe fittings
7.6 Tools and equipment used in plumbing works

7.7 Ferro cement technology and its application in reservoir construction

Unit 8. Estimation [16 hrs]

8.1 Estimate and Its Types – Preliminary, Plinth area, Cubic rate estimate, approximate quantity estimate, Detailed estimates, Annual Repair and maintenance, Complete estimates

8.2 System of Units of Measurement

8.3 Analysis of Rates – Brickwork, Cement Plastering, PCC, PCC for RCC

8.4 Methods of Building Estimate – Long and short wall method, Center line method, Crossing method

8.5 Detailed Estimate

Test and Revision [10 hrs]

Reference Books

1. *Building Construction - Sushil Kumar*
2. *Engineering Costing and Supervision (CTEVT)*
3. *ejg lgdf{0f- k|f=lz=tyf Jof=tf=kl/ifb*
4. *u|fdLOf vfg]kfgL k|0ffnL lgdf{Of tyf Joj:yfkg - xl/k|';fbzdf{*
5. *Engineering Materials, Surendra Singh*
6. *Lecture notes on Civil construction*
7. *Amarjit, Aggarwal "Civil Engineering quantity surveying and valuation", Kaston Publishing house Ludhiana, 1985.*
8. *M. Chakrawarti "Estimating costing and specification".*
9. *B.N. Dutta "Estimating and Costing".*
10. *Seymour Berger and Jules B. Godel, "Estimating and project management for small construction firms". Van Nostradn Reinhold Publishing Co. New york.*

Practical

Unit 1. Drawing and Estimation of Engineering Structures [22 hrs]

1.1 Understanding technical drawings of various engineering structures

1.2 Drawing of simple building

1.3 Estimate of one room and double room building

1.4 Estimate of retaining wall

1.5 Estimate of Road Side Drain

Unit 2. Outdoor [8 hrs]

2.1 One day field visit of construction site

Cadastral Surveying

EG 3103 GE

Year: III
Semester: V

Total: 16hrs/week
Lecture: 6hrs/week
Practical: 10hrs/week

Course Description:

This course is designed for the students pursuing diploma in Geomatics Engineering. The focus of the course is to fulfill the requirement of survey technicians involving in the sector of cadastral surveying and mapping in Nepal.

Course Objectives:

After the completion of this course, students will be able to explain the concepts of the followings and application of the same in the field of cadastral surveying:

1. Concept of cadastral surveying and mapping
2. Importance of cadastral surveying
3. Step by step approach to be followed for cadastral surveying
4. Advancement in the sector of cadastral surveying

Course Contents:

Unit 1. Introduction

10 hrs

- 1.1 Cadastre,
- 1.2 Cadastral Surveying,
- 1.3 Historical development of Cadastral Surveying in Nepal,
- 1.4 Types of Cadastre: Fiscal, Legal and Multipurpose Cadastre,
- 1.5 Graphical and digital cadastre,
- 1.6 Cadastral Components (map, terij, field book, plot register, title documents, database)
- 1.7 Importance of Cadastre,
- 1.8 Definition of parcel,
- 1.9 Parcel numbering system,
- 1.10 Parcel boundary,
- 1.11 Types of parcel boundary: General and fixed boundary
- 1.12 Basic principle of cadastral surveying

Unit 2. Cadastral Surveying Techniques

[10 hrs]

- 2.1 Annotation on existing map/image,
- 2.2 Cadastral surveying by using chain/tape, Cadastral surveying by using compass,
- 2.3 Cadastral surveying by using Plane table alidade,
- 2.4 Cadastral surveying by using Total station,
- 2.5 Cadastral surveying by using Aerial photograph/ Orthophoto/Satellite imagery/UAV,
- 2.6 Cadastral surveying by using GPS
- 2.7 Hybrid method,
- 2.8 Comparison of different methods

Unit 3. Cadastral maps

[10 hrs]

- 3.1 Map Projection and sheet numbering for cadastral maps,
- 3.2 Geodetic control points for cadastral surveying and mapping,
- 3.3 Different types and scale of cadastral maps (index map, file map, parcel map),
- 3.4 Plotting Error,
- 3.5 Various kinds of Parcel numbering system,
- 3.6 Specifications and Standards of cadastral maps.

Unit 4. Graphical Cadastre	[5 hrs]
4.1 Plane Table and Accessories,	
4.2 Plane table setting,	
4.3 Surveying and mapping,	
4.4 Inking and tracing of cadastral maps,	
4.5 Area Computation and checking,	
4.6 field book and other Document preparation (manual)	
Unit 5. Digital Cadastre	[10 hrs]
5.1 Equipment (Total Station), tools and accessories for data acquisition,	
5.2 Preparation for data acquisition,	
5.3 Parcel boundary survey and measurements,	
5.4 Sketch preparation,	
5.5 Data download,	
5.6 Map making	
5.7 Database preparation,	
5.8 Field book and other documents (report) preparation,	
5.9 LIS: Concept and implementation	
Unit 6. Land Registration	[5 hrs]
6.1 Basic concept of registration,	
6.2 Types of registration: Conveyancing, registration of deeds, registration of title,	
6.3 Registration system adopted by Nepal.	
Unit 7. Cadastral Surveying and Registration Procedure in Nepal	[10 hrs]
7.1 Notification,	
7.2 Densification of Control Points,	
7.3 Adjudication (Sporadic and Systematic),	
7.4 Field book preparation,	
7.5 Land Classification,	
7.6 Area Computation,	
7.7 Registration of Ownership,	
7.8 Settlement of Civil Cases and Disputes,	
7.9 Ownership certificate and other document Preparation,	
7.10 Data Management,	
7.11 Handing Over of cadastral data	
Unit 8. Updating and Archiving Cadastral Documents	[10 hrs]
8.1 Parcel subdivision,	
8.2 Parcel history maintenance,	
8.3 Plot register maintenance,	
8.4 Database updating and maintenance,	
8.5 Procedures at Survey offices	
Unit 9. Cadastral organizations and their roles in Nepal	5 hrs
9.1 Concerned Ministry,	
9.2 Survey Department,	
9.3 Department of Land Reform and Management	
9.4 Department of Land Information and Archive,	
9.5 District Survey Offices,	
9.6 District Land Revenue Offices,	
9.7 Local Authority	

- Unit 10. Modern Cadastre: example of developed cadastre** [10 hrs]
- 10.1 General Introduction to Modern Cadastre,
 - 10.2 Examples of Modern Cadastre around the world (Dutch Cadastre, LINZ, Singapore Cadastre)
 - 10.3 FIG and Cadastral concept by FIG (Cadastre 2014, Cadastre 2034)

Revision and Test [5 hrs]

Practical

Field work **100 hrs**

- Cadastral data acquisition on the scale of 1:500 using Plane Table (Step by step approach to be followed by Nepalese cadastral surveying)
- Digital cadastral survey of selected land parcels using Total station
- Parcel Identification and Boundary demarcation or layout

Class room exercise **50 hrs**

- Inking and Tracing Exercise of Graphical Cadastral Map
- Area Computation in Analogue Environment
- Using tiles and computing scale
- Using triangle formula
- Using coordinates
- Documentation of cadastral activities: field book, notice, land registration records, land registration certificates,
- Parcel subdivision
- Organization of Field Data
- Data Download
- Plotting and mapping
- Creating database
- Generating forms and reports
- Performing parcel split, merge and other functions of survey office

Reference Books

1. *Cadastral Survey within the commonwealth P.F Dele, MA ARICS (1976)*
2. *Land Registration and Cadastral System, Gerhard Hursson*
2. *Surveying Vol I and II, S.K DUGGAL*
3. *कित्तानापीनिर्देशिका, नापीविभाग*
4. *नापीशाखाएवं नापीगोश्वाराको कार्यविधि, नापीविभाग*
5. *जनउपयोगिताको लागी कित्तानापी : बुद्धि नारायण श्रेष्ठ*
6. *Plane Surveying, David Clark*
7. *भूमिलगत रजिष्ट्रेशन र कित्तानापी, बेखालालश्रेष्ठ*

Land Administration and Land Laws

EG 3104 GE

Year: III

Semester: V

Course Description:

This subject consists of two units related to Land Administration and Land Laws. These topics cover the general aspects of land administration system and legal arrangements made for addressing land related issues in Nepal.

Total: 6 hour /week
Lecture: 4 hours/week
Practical: 2 hours/week

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 Land Surveying.

1. General concept of land administration and management
2. Role of land administration and management in Social/National development
3. Issue of land administration and legal arrangement made to address the problems
4. Support the land administration functions and solve the real world problem by making use of proper acts/ rules/directives

Course Contents:

Unit 1: Introduction

5hrs

- Land: Definition and concept,
- Importance of land for human being,
- Importance of land in national development,
- Land Administration: Definition and concept,
- General function of land administration,
- Importance of land administration,
- Components of land administration

Unit 2: Basics of Land Tenure and Rights

4hrs

- Land tenure: Definition and concept,
- History of land tenure and practices (Raikar, Guthi, Kipat, Birta, Jagir, Rakam, Kipat, Jhora, Ukhada, Swabasi, Benissa, bahalbatauri, state land)
- Land tenure system in Nepal; Informal, Non-formal and formal,
- Land right: basic concept
- Different types of right on property: freehold, use right, lease, access right
- Security of land tenure and its importance,

Unit 3: Land Registration System

6hrs

- Concepts and definitions,
- Concept of first registration,
- Different Land Registration Systems: Conveyancing, Deeds, Title,
- Difference between various registration systems,
- Merits and demerits of registration system,
- Land registration system in Nepal: Historical Background, Existing Registration System, Processes
- Registration of various types of land (Raikar, Guthi, Birta, Swabasi, Benissa, Bahalbatauri, Chhutjagga, Gaun block)

Unit 4: Land and property transfer process

5hrs

- Different types of land transactions (Rajinama, Anshabanda, Bakaspatra) and their process,
- Whole parcel transaction,

<ul style="list-style-type: none"> • Parcel subdivision, • Individual/ multiple / institutional ownership 	
Unit 5: Land conflicts and their resolutions	3 hrs
<ul style="list-style-type: none"> • Land disputes Related to parcel boundary, • Land Area and Ownership, • Land Tenureships (Mohi) and dual ownership, • Mediation and its role in land dispute settlement 	
Unit 6: Basics of Land Management	10hrs
<ul style="list-style-type: none"> • Concept, meaning and definition of land management, • Land Use: Concepts and determinants, • land use policy, • land use planning, • land use zones, • Importance of land use zoning, • Land Pooling, • Land Consolidation, • Land Acquisition, 	
Unit 7: Land Reform	6hrs
<ul style="list-style-type: none"> • History of land reform in Nepal, • Concepts, and Types of land reform • Enhancing access of Socio-economically deprived people to land, • Land ceilings, • Dual ownership, • Managing informal settlements and landlessness 	
Unit 8: Land Valuation	4hrs
<ul style="list-style-type: none"> • Land Value, • Land Valuation Parameters, • Land Valuation techniques, • Land valuation in Nepal • Land Market, • Land Tax 	
Unit 9: LIS and Modernizing Land Administration Services	5hrs
<ul style="list-style-type: none"> • Application of ICT in LA, • Record digitization, • Online services, • LIS: concept and definition, • Components of LIS, • Importance of LIS, • LIS development in Nepal 	
Unit 10: Land Laws in Nepal	8hrs
<ul style="list-style-type: none"> • Concepts and definition, • Historical Background, • Constitution of Nepal (Related sections), • Land (Survey and Measurement) Act and Rules, • Land related Act and Rule, 	

- Land Revenue Acts and Rule,
- Land Acquisition Act and Rules,
- Muluki Dewani Sanhita (related section),
- Land Administration Directives,
- Cadastral Survey Directives

Test and Revision

4hrs

Practical

Basic Land Administration Skills: Practical and Exercises

30 hrs

जग्गा दर्ता, मोठ श्रेस्ता, लिखत, रोक्का, फुकुवा, नामसारी, अंशवण्डा, दाखिल खारेज, लिखत बमोजिम नक्शामा कित्ताकाट, टायलचेक, नक्सा ट्रेस, फिल्डबुक उतार, प्लट रजिस्टर उतार, प्लट रजिस्टर अध्यावधिक, फिल्ड रेखांकन, हालसाबिक, फायल नक्शा, पार्सल नक्शा, लगतकट्टा, कित्ताएकीकरण, नक्शामा घर बाटो जनाउने, घर बाटो प्रमाणित गर्ने, सूचना लेख्ने, म्याद काट्ने, म्याद तामेल गराउने, तारेख पर्चा लेख्ने, मुचुल्का उठाउने, सनाखत गराउने, भर्पाइ गराउने, बयान गराउने, टिप्पणी उठाउने फिल्ड प्रतिबेदन लेख्ने, फायल पन्जिका बनाउने।

References:

- Land law and registration: S.R. Simpson
- Land registration: B. L. Shrestha
- Bhumi lagat, registration ra kitta napi: B.L. Shrestha
- Land (Survey and Measurement) Act 2019 and Rules 2058
- Land related Act 2021 and Rule
- Land Revenue Acts 2034 and Rule
- Muluki Ain (related section)
- Kitta napi karyabidhi- Survey Department of Nepal
- Jagga prashashan karyabidhi- Survey Department of Nepal

Survey Project Management

EG 3105 GE

Year: III
Semester: V

Total: 6 hour /week
Lecture: 4 hours/week
Practical: 2 hours/week

Course Description:

This course is designed to provide basic idea of survey management. The main focus lies on the management of surveying and mapping projects. The course includes some important aspects of survey management such as terms of reference, specification, project planning, resource allocation, costing, executing surveying projects and reporting.

Course Objective:

The main objective of this course is to make the mid-career survey professionals aware about various aspects of surveying and mapping projects. It is aimed that at the completion of the course, a student will be able to

1. Formulate a surveying and mapping project proposal
2. Planning of a minor surveying and mapping projects
3. Identify needs for surveying and mapping projects
4. Understand the terms of reference and specifications of a particular project
5. Estimate the cost of minor surveying and mapping projects
6. Reporting minor surveying and mapping projects

Course Content:

Unit 1: Introduction and basic concept of Project

5hrs

- 1.1 Concept and definition of project,
- 1.2 Characteristics of project,
- 1.3 Importance of project,
- 1.4 Feasibility study of project,
- 1.5 Various phases of project,
- 1.6 Project cycle

Unit 2: Basics of Management

7hrs

- 2.1 Definition of management,
- 2.2 Basic principles of Management,
- 2.3 Management functions (POSDCORB),
- 2.4 Role of a Manager in organization,
- 2.5 Concept of Leadership,
- 2.6 Characteristics of good leader,
- 2.7 Concept of Motivation,
- 2.8 Basic understanding of motivation theories (Maslow, Hertzberg),
- 2.9 Importance of motivation,

Unit 3: Survey Projects Management

10hrs

- 3.1 Identification of needs
- 3.2 Feasibility study
- 3.3 Terms of Reference,
- 3.4 Technical Standards and Specifications
- 3.5 Project Planning
- 3.6 Tools, Equipment and Accessories,
- 3.7 Checking and adjustment of instrument
- 3.8 Costing and budgeting
- 3.9 Team formation, Job Allocation and Job Description,
- 3.10 Resource Management: Human and Financial Resources

- 3.11 Coordination
- 3.12 Task Supervision, Monitoring and evaluation

Unit 4: Proposal and Report Writing Skill **8hrs**

- 4.1 Understanding proposal,
- 4.2 types of proposal,
- 4.3 objective of proposal,
- 4.4 Language Proficiency in Writing -English/Nepali,
- 4.5 Writing Technical Proposal: Structure and Contents,
- 4.6 Writing Financial Proposal: Structure and Contents,
- 4.7 Basics of report writing,
- 4.8 different types of report,
- 4.9 objectives of report writing,
- 4.10 Report Writing: Structure and Contents,
- 4.11 Presentation Skill

Unit 5: Public Relation, **5hrs**

- 5.1 Introduction to public relation
- 5.2 dealing with community,
- 5.3 organizing meetings,
- 5.4 communicating skills,

Unit 6: Professionalism **8hrs**

- 6.1 Profession and professionalism,
- 6.2 Attitude and behaviors,
- 6.3 moral principles and ethics,
- 6.4 code of conducts,
- 6.5 Role of a Surveyors, code of conduct for a surveyor (By FIG, RICS),
- 6.6 Concept of Legal provision and government policy governing a particular Survey Project,
- 6.7 Professional organizations and their role,
- 6.8 Basic introduction to international organizations (AARS, PCGIAP, FIG, ISPRS)
- 6.9 Survey Licensing,
- 6.10 Licensing practice in Nepal

Unit 7: Safety Management **5 hrs**

- 7.1 Personal safety,
- 7.2 Safety of instruments and equipment,
- 7.3 Managing stress
- 7.4 Data safety,
- 7.5 Emergency situation and rescue measures,
- 7.6 Insurance,

Unit 8: Basics of first aid **8hrs**

- 8.1 First aid: Preserving life, prevent further injury, Promoting recovery,
- 8.2 Conditions that often require first aid : Altitude sickness, swelling of brain or lungs, Alergens, such as insect bites, Bone factures, Burns, Chocking, Cramps, Heart attacks, Hyperglycaemia, Hypothermia, Poisoning, Insect and animal bites, Muscle strains, Stroke, Snake bite, Wounds and bleeding(including lacerations, incisions and abrasions, Gastrointestinal bleeding, avulsions and Sucking chest wounds), Heat induced illness, First aid kits

Test and Revision **4hrs**

Practical and exercise**30 hrs**

1. Preparation of simple specification of a survey project
2. Developing simple ToR of a survey project
3. Concept of SWOT analysis
4. Planning a field trip of a survey project
5. Forming a team Preparation of job descriptions of a survey task
6. Basics of Costing and budgeting of a survey project
7. Simple proposal writing
8. Simple report writing
9. Organizing demo workshop / seminar / group discussion for consultations with stakeholders to identify project needs or to appraise a project

Reference Books

1. *Cadastral Survey within the commonwealth P.F Dele, MA ARICS (1976)*
2. *Effective Performance in Project Management, Jan Wisen and orjeLindblom*
3. *Project proposals and reports from different organizations*

Sixth Semester

Subjects:

- 1 EG 3201 GE Engineering Survey
- 2 EG 3201 MG Entrepreneurship Development
- 3 EG 3202 GE GIS Application
- 4 EG 3203 GE Project Work

Engineering Survey

EG 3201 GE

Year: III
Semester: VI

Total: 12 hrs/week
Lecture: 4 hrs/week
Practical: 8 hrs/week

Course Description:

This course focuses on Theoretical knowledge and Technical skill required for carrying out Surveying and mapping works related to various engineering projects.

The contents of the course emphasize mainly on

1. Precise understanding of Engineering surveying and methods
2. Construction related to physical infrastructure such as Road, Canal, Hydropower
3. Site surveys
4. Hydrographic survey

Course Objectives:

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

1. Understand the concept of engineering surveying
2. Perform surveying related to different construction project for Infrastructure planning, Design layout, Monitoring ongoing construction and Update map as-built
3. Produce spatial data and information required by construction engineers (coordinates, Control network layout, Large scale maps and Ground profiles)

Course Contents:

Unit 1: Introduction to Engineering Survey

8

- 1.1 Definition of Engineering survey
- 1.2 Survey component in various engineering construction projects
 - control survey
 - topographic survey
 - construction survey
 - as-built survey
 - referencing with National geodetic network
- 1.3 Establishment/ extension of Ground survey controls (Horizontal and Vertical)
- 1.4 Precision and Accuracy specifications
- 1.5 Choice of instruments and methods of surveying

Unit 2: Route Survey

10

- 2.1 Meaning and concept of Routes
- 2.2 Surveying for different types of Routes
 - Road
 - Railway
 - Canal
 - Water Supply/Pipe lines
 - Transmission line
 - Tunnel
- 2.3 Strip Topographic mapping (Details and Contours)
- 2.4 Profile (Longitudinal and Cross Sections)

Unit 3: Curve

12

- 3.1 Introduction and classification of curve
- 3.2 Designation of Curve
- 3.3 Elements of Simple Circular curve
- 3.4 Setting out Simple circular curve:

<ul style="list-style-type: none"> • Method of offset from long chord • Method of offset from Tangent • Rankin's Method of deflection angle • Coordinates method 	
3.5 Concept of Transition curve	
3.6 Super elevation	
3.7 Introduction to Vertical curve	
Unit 4: Area and Volume	12
4.1 Area of regular geometrical figures	
4.2 Area of Irregular figure <ul style="list-style-type: none"> • Average ordinate method • Trapezoid method • Simpson's method 	
4.3 Area measurement by coordinates	
4.4 Area determination by graphical method (on the map) <ul style="list-style-type: none"> ▪ Square grids ▪ Planimeter 	
4.5 Volume of geometrical shapes (Cube, Paralloiped, Sphere, Cylinder, and cone)	
4.6 Determination of Volume/Earthwork quantity: <ul style="list-style-type: none"> • Area of cross section (level section) • Spot heights • Contour maps 	
Unit 5: Site Survey	6
5.1 Introduction	
5.2 Site survey methods for Building, Road, Bridge, Dam, Power House	
5.3 Establishment of control points and Bench Marks.	
5.4 Computation and Plotting field data	
5.5 Preparation of plans and profiles for different component of construction site	
5.6 Transfer of the map data on the ground	
5.7 Layout of designs (Building, Road, Bridge, Dam, Power House)	
Unit 6: Hydrographic Survey	6
6.1 Introduction	
6.2 Sounding (different instrument used in surveying)	
6.3 Sounding measurement by direct and indirect methods.	
6.4 Measurement of the Velocity of the river by float method and current meter	
6.5 Measurement of Discharge by Area of cross section method	
6.6 Methods of locating the soundings	
Revision and Test	6
Practical	
Unit 1: Outdoor (Field Work)	80
1.1 Route Survey (Road alignment, Geometric design)	
1.2 Bridge site Survey	
1.3 Setting out simple circular curves.	
1.4 Discharge measurement of a river (float and current meter)	
Unit 2: Indoor	40
2.1 Computation of existing field data for engineering surveys	
2.2 Plotting of existing data	
2.3 Preparation of Plans and Profiles	

2.4 Earth work estimation

References:

1. Surveying Vol. II, Dr. B.C Punmia, A.K Jain, Laxmi Publication Pvt. Ltd. New Delhi
2. Surveying Vol. I , S. K Duggal, Tata McGraw Hill Publishing Company Ltd. New Delhi
3. Fundamental of Surveying, S.K Roy, Prentice Hall of India, New Delhi
4. प्रारम्भिक नापी, महेश्वर भट्टराई, पाठ्यक्रम विकास केन्द्र, त्रिभुवन विश्वविद्यालय, काठमाडौं, नेपाल
5. Surveying, A. Bannister and S. Raymond, ELBS
6. Surveying for Engineers, J. Uren and W.F. Price, ELBS
7. Surveying for Construction, William Irvine, McGraw-Hill
8. Engineering Surveying Manual, American Society of Civil Engineering, Scientific Publishers, , India
9. Introduction to Surveying, Anderson and Mikhail
10. Elements of Plane Surveying, Arthur R. Benton, Jr. and Philip J Taetz, McGraw-Hill

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]

1. Overview of entrepreneur and entrepreneurship
2. Wage employment , self- employment and business
3. Synopsis of types and forms of enterprises
4. Attitudes, characteristics & skills required to be an entrepreneur
5. Myths about entrepreneurs
6. Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal

Unit 2: Exploring and Developing Entrepreneurial Competencies: [10 Hours]

1. Assessing individual entrepreneurial inclination
2. Assessment of decision making attitudes
3. Risk taking behavior and risk minimization
4. Creativity and innovation in business
5. Enterprise management competencies

Unit 3: Business identification and Selection: [4 Hours]

1. Sources and method of finding business idea(s)
2. Selection of viable business ideas
3. 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.

GIS Applications

EG 3202 GE

Year: III
Semester: VI

Total: 10 hour /week
Lecture: 4 hours/week
Tutorial: hours/week
Practical: 6 hours/week

Course Description:

The primary objective of this course is to impart the knowledge of GIS applications as a planning and decision making tool. The course focuses spatial analysis and visualization of analysis results. The courses aim to introduce various applications of GIS in various sectors.

Course Objectives:

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

1. Perform simple spatial analysis
2. Map design and use of proper visual variables
3. Visualize different types of data in forms of maps
4. Conceptualize GIS as a decision support tool
5. Understand the basic application of GIS in spatial planning
6. Perform task for using GIS for service delivery in Survey offices of Nepal

Course Contents:

Unit 1: Data Integration

[6hrs]

- 1.1 Concept of data Integration
- 1.2 Importance of spatial data integration
- 1.3 Process of data integration
- 1.4 Join and relate spatial and attribute data
- 1.5 Projection and transformation of spatial data
- 1.6 Integration of cadastral data

Unit 2: Spatial Analysis

[15 hrs]

- 2.1 Introduction:
 - Spatial analysis
 - Importance of spatial analysis
 - Types of spatial analysis (Functions of spatial analysis)
- 2.2 Classification and Measurement function
 - Measurement of coordinates and distance in raster and vector data
 - Spatial selection queries
 - Classification of data (manual and automatic classification of data)
 - Application of classification and measurement function
- 2.3 Overlay functions and Neighborhood Analysis
 - Vector and raster overlay operations and use
 - Neighborhood function (Generating buffer zone)
 - Application examples of overlay and network function
- 2.4 Network analysis function
 - Process of network analysis
 - Application of network analysis
- 2.5 3D Analysis
 - Define 3D representation of Earth surface
 - Explain the methods for Generating contours and 3D surface from 3D points
 - Introduce followings:
 - Slope/Aspect/Hill-shade
 - Surface area and volume
 - Contour and profile generation

- Define Digital Elevation Model (DEM) and Digital Surface Model (DSM)
- Application of Digital Elevation Model (DEM) in spatial planning

Unit 3: Visualization of data

[12hrs]

3.1 Introduction

- Define visualization
- Various visualization technique (Hard and softcopy)

3.2 Map Data Types

- Types of data (qualitative and quantitative)
- Visual variables
- Use of visual variables for spatial data visualization.

3.3 Types of Maps and Map design Principles

- Types of map for visualization (Static, dynamic and interactive maps)
- Base and thematic map
- Map Design Concept and importance
- Web map and digital map

Unit 4: Data Quality

[8 hrs]

4.1 Data Quality

- Define Data quality
- Data quality components
 - Spatial accuracy
 - Attribute accuracy
 - Temporal Accuracy
 - Logical Consistency
 - Lineage etc.

4.2 Accuracy Assessment

- Accuracy and precision of data
- Error propagation
- RMSE error during accuracy assessment (user accuracy and producers accuracy)

Unit 5: GIS Project development

[6 hrs]

5.1 Project definition

- Define problem related to spatial planning of a case

5.2 Project Design

- Conceptual Design
- Logical design
- Physical design
 - Design data models required for the project
 - List the resources required for the project
 - Discuss the possible problems
 - List out the expected project out comes

5.3 Project Implementation

- Prepare the project implementation schedule

5.4 Project Evaluation

- Define project Evaluation
- Setting evaluation criteria

Unit 6: Spatial Data Infrastructure (SDI)

[8hrs]

6.1 Concept of SDI

6.2 Components and importance of SDI

6.3 Meta data and Clearinghouse

6.4 Different level of SDI (Local, Regional and Global SDI)

6.5 Present Situation and Challenges of SDI in Nepal

Test and Revision

[5hrs]

Reference Books

1. An Introduction to Geographical Information System - Ian Heywood, Sarah Cornelius, Steve Carver, Pearson Education, Pearson Education (Fourth Edition) 2005
2. Principles of Geographic Information System - Rolf A. de By (ed.) (ITC Education Text Book Series; 1)
3. Cartography Visualization of Geospatial Data – Menno Kraak & Ferhan Ormeling
4. Principles of Geographical Information System - Peter. A. Burrough and Rachael A. McDonnell
5. Geographical Information system and computer Cartography - Christopher S. Jones
6. Elements of Cartography, H. Robinson

Practical

Unit 1: Spatial Analysis [10 hrs]

- 1.1 Integrate spatial data from different sources (join attribute tables, import external data into GIS)
- 1.2 Conversion of coordinate and projection
- 1.3 Calculate Geometry of raster and vector data
- 1.4 Query databases
- 1.5 Perform Geo-processing and Computation
- 1.6 Generate Buffer Zone (point, line, Polygon buffer)
- 1.7 Convert Vector to raster and raster to vector

Unit 2: 3D Analysis [10 hrs]

- 2.1 Create TIN surface from 3D points of Features
- 2.2 Generate DEM from different data sources (3D points, Contours)
- 2.3 Create Counters using 3D point data and DEM
- 2.4 Generate Slope/Aspect/Hill shade raster
- 2.5 Calculate Surface area and volume from DEM
- 2.6 Generate profiles

Unit 3: Visualization and map cartography [10hrs]

- 3.1 Layout preparation
- 3.2 Generalize map elements
- 3.3 Apply Cartographic principles of map design
- 3.4 Use appropriate Color in maps
- 3.5 Symbolize features
- 3.6 Place features and Geographic names
- 3.7 Label features
- 3.8 Insert legend north arrow, grid, scale, title, projection information, map notes
- 3.9 Export maps in to different formats

Unit 4: Thematic Mapping [10hrs]

- 4.1 Visualize themes in maps (Using Graduated Color, Graduated symbols, Proportional symbols, and dot density)
- 4.2 Compose maps and show the thematic information using appropriate Graphs and charts

Unit 5: Application of GIS in Surveying and parcel Mapping (20 hrs)

- 5.1 Handling cadastral application software used by Survey offices
- 5.2 Cadastral data management and preparation
- 5.3 Parcel Subdivision and parcel map printing
- 5.4 Report generation and printing (field book, plot book, land owner certificate)

Unit 6: Project Work

[30 hrs]

Project work relevant to GIS application will be assigned to the student(s) and they are required to submit their project report. Different case study will be provided to the students and they can choose a case of their interest. The project work supposed to be completed in group or individually. Student will complete project work under the minimum supervision of instructor. Relevant data and guidelines for given case study will be provided by the course instructor.

The project work will be based on the following cases.

1. Topographic mapping
2. Digitization and map preparation
3. TIN and 3D analysis
4. Land use planning/ plotting and mapping
5. Thematic mapping
6. Suitability analysis (site suitability)
7. Socio-economic analysis
8. Hazard map preparation
9. Cadastral mapping
10. Change analysis (urban expansion)
11. Database Design (municipal)

Project Work

EG 3203 GE

Year: III
Semester: VI

Total: 13 hour /week
Lecture: hours/week
Tutorial: hours/week
Practical: 13 hours/week

Course Description:

In the end of the course students shall be given a project work related to one subject area for which they will employ their knowledge and skills in planning, executing and evaluating of project. Basic theoretical concept about project design, planning, implementation, evaluation and reporting will be provided at the outset of the project. The students shall carry out the project task on the basis of their acquired knowledge and skill in the field of Geomatics.

Course Objectives:

The objective of the project work is to employ the student's knowledge and skills in real work situation. After completing the project work, students will able to

1. *Design a Project Work and develop project proposal*
2. *Planning survey project and estimate the resources required*
3. *Execute the survey project on specified area*
4. *Evaluate the project outcomes*
5. *Prepare the project reports and to present the project outcomes*

Project Work:

1. The Project work will be based on any one of the following themes/topics
2. Development of proposal, Data acquisition, reporting part of the project work will be carried out by a group of specified number of students. Individual member of the group are required to submit their own performance on Computation/ data analysis, and mapping etc.

Topic 1. Bridge site Survey

Students will be required to carry out the bridge site surveying and for this student(s) will conduct field survey for data capture. Students will prepare the maps, profile, graphs and relevant out-put using field survey data. Available instruments in the institute shall have to be used.

Topic 2. Route survey

Students will be required to carry out the route surveying of specified feature and for this they will conduct field survey for data capture. Students will prepare the maps, profile, graphs and relevant out-put using field survey data. Available instruments in the institute shall have to be used.

Topic 4. Topographical Surveying

Students will be required to carry out the topographical survey of specified area. For this they will conduct field survey for data capture. Students will prepare the topographical maps using field survey data. . Available instruments in the institute shall have to be used.

Topic 5. Cadastral Surveying

Students will be required to carry out the cadastral survey of specified area and for this they will conduct field survey for data capture. Students will prepare the cadastral

maps, other cadastral records using field survey data. . Available instruments in the institute shall have to be used.

Topic 6. *Map Digitization and updating through field verification*

A hard copy of map section will be provided and the student will prepare the digital databases from the existing map and update the major changes using field surveying data.

Topic 7. *Resource mapping*

Digital Base map will be provided and the student will carry out the GPS surveying using hand held GPS and prepare the databases and maps showing the location of resources

Topic 8. *Thematic Mapping*

Digital Base map of study area will be provided and the student will obtain the relevant thematic information/data using primary or secondary sources. Students will tabulate, manage and analyze the data and they will visualize their analysis in different thematic maps, charts and tables. The analysis should link with spatial context of the selected theme. The study can be focused on one or more of the following themes.

- Population, Population density
- Poverty
- Facilities and accessibility in the resources
- Education status
- Employment and economic condition
- Gender issues and domestic conflict etc.
- Disaster mapping

Evaluation of Project work:

The evaluation of the project work will be based on the project proposal, final project report, presentation and viva.

References:

1. *Project Reports of different engineering projects*
2. *Technical Writing Process and Product - Sharon J. Gerson/ Steven M. Gerson, Pearson Education Asia.*