CURRICULUM
for
DIPLOMA
in
Geomatics Engineering
(Three Years Program- Semester System)

Council for Technical Education and Vocational Training
Curriculum Development Division
Sanothimi, Bhaktapur
Course Developed in 2000 as Diploma in Survey Engineering
Revised in 2010

Diploma in Geomatics Engineering, 2010
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Diploma in Geomatics Engineering- 2010
4.3 Map Composition
Cadastral Surveying
Unit 4: Exercise on Digital Photogrammetry (12hrs+12hrs)
Remote Sensing
EG3202GE
Civil Construction
Project Work
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
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
**Background**

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.

1. **Introduction:**

   This curriculum is of three years duration with six semesters. 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.

2. **Course title:**

   Diploma in Geomatics Engineering

3. **Course Objectives:**

   - This course is designed to produce Surveyors / Geomatics Technicians meeting the requirement of intermediate level of surveyors for the Government and engineering construction industry / companies
   - The graduates shall have adequate knowledge and skill in spatial data acquisition using field survey methods, processing and visual presentation
   - The graduates will have working knowledge in interpreting image data acquired through Air survey and Remote Sensing
   - The graduates shall be capable for continuing higher education.

4. **Duration:**

   3 Academic Years (Six Semesters)- 15 weeks/semester, 40 hrs/ week.

5. **Target Group:**

   SLC passed or equivalent

6. **Group size:**

   A maximum of 48 (Forty eight) in a batch
7. **Target location:**
The main targeted group will be from all over Nepal. Foreign student are eligible to get admitted in the course with due permission of CTEVT.

8. **Entry criteria:**
- SLC or equivalent with English, Science, and Mathematics or Technical SLC (TSLC) course in related subjects.
- Should pass entrance examination.
- Candidate should be physically fit for the program.

9. **Selection:**
Applicants fulfilling the entry criteria will be selected for admission in order of merit in entrance examination result.

10. **Medium of instruction:**
The medium of instruction will be in English/ Nepali or both.

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

12. **Teacher and student ratio:**
- For theory: As per the nature of the course.
- For practical / demonstration: 1:12.
- For bench work: 1:6.
- 75% of the technical teachers must be full timer.

13. **Teachers and Instructors:**
- The teacher must possess a minimum of Bachelor's Degree in the related field or Equivalent with three years experience in the related field.
- The Instructor must hold a minimum of Intermediate degree or equivalent in the related area with three years of experience in the relevant field.

14. **Mode of Education:**
There will be inductive and deductive mode of education.

15. **Instruction methods:**
- Lecture will be the method of instruction supported by tutorials and practical works.
- The topic and concepts presented in the lecture will be enlarged and developed in tutorials.
- Practical classes will be used in the form of in-door and out-door field exercises and laboratory works. Group works and project work tools will be used for practical application of the knowledge and skills gained.
16. **Examination and marking scheme:**

- The subject teacher will internally assess the students’ achievement in each subject during the course at least two times followed by a final examination at the end of each semester.
- Theoretical subjects will be evaluated at 20% for the internal assessment and 80% for the semester final examination.
- Practical subjects will be evaluated at 60% for the internal assessment and 40% for the semester final examination.
- All theory components in the final semester examination will be evaluated through written tests.
- Generally the method of continuous assessment will be adopted for practical components.
- Examination for the practical components of the course will be made through lab works, documentation of practical exercises, performance skill tests and viva.
- Student who fails in the internal assessment of any of the subjects will not be qualified to sit in the semester final examination in the particular subject.
- Any student not being able to attend the semester final exam will not be allowed to continue in the successive semester.

17. **Provision of back paper:**

There will be the provision of back paper examination but student must pass all the subjects of all six semesters within six years from the enrolment to qualify for the Diploma.

18. **Certification and degree awards:**

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

19. **Disciplinary and ethical requirements:**

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

20. **Pass marks:**

The students must secure 40% marks in the internal assessment and 40% in the semester final examination of each subject to pass the subject.
21. **Grading system:**

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

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

22. **Curriculum and credits:**

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

23. **Course Description**

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. 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.

24. **Subjects Codes**

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

25. **Career Option:**

- The graduates will be eligible for the position of Non-gazetted class I in Nepal Government services as Surveyor or as prescribed by the Public Service Commission of Nepal.

- The graduates well acquainted with land data acquisition, process and visual presentation with fundamental knowledge of GIS and remote sensing are highly in demand in the engineering profession.
- The DiGE graduates can well serve as Geomatics Technicians in the field of Local level planning, Land resource management, Natural Resource planning, and development construction

- The graduates are eligible for their academic pursuance in Bachelor's level of education.
# Diploma in Geomatics Engineering
## Curriculum Structure

**Year: I**

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**Part: I**

**Part: II**

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*Diploma in Geomatics Engineering- 2010*
## Diploma in Geomatics Engineering

### Curriculum Structure

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# Diploma in Geomatics Engineering
## Curriculum Structure

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First Year
(Semester I & II)
# Semester I

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<td>EG1107GE</td>
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कम्युनिकेसन नेपाली
ई.जी. १९०१ एस.एच.

वर्ष: प्रथम
कक्षा: २ घण्टा / ह्प्ता
सेमेस्टर: प्रथम
प्रवचन: २ घण्टा / ह्प्ता
विषय: घण्टा / ह्प्ता
प्रयोगात्मक: घण्टा / ह्प्ता

कोर्सको परिष्कार
यस विषयमा विश्वासीहरूले भाषी व्यवसायमा प्रभावकारी डिजलै सजन्ताल गर्नका लागि आवश्यक पनि ज्ञान र सीपसंग सम्बन्धित नेपाली सञ्चारात्मक भाषा, लेखन सीप, र कृति परिचयको ढाँचा गरी जम्मा ३ वटा एकाईहरू सम्बन्धित गरिएका छौ।

कोर्सको उद्देश्यः
यस पाठ्याङ्कको अध्ययनबाट विश्वासीहरूले निम्नलिखित भाष्पक श्रमाता विकास गर्न सक्नेछः—
१. आफ्नो व्यवसायक कार्य क्षेत्रमा प्रभावकारी सजन्ताल गर्न
२. आफ्नो व्यवसायसंग सम्बन्धित विचित्र लेखन सीप प्रदर्शन गर्न
३. कार्य संपादनमा आवश्यक परिस्थितिजन्य संवाद गर्न।

पाठ्याङ्कको विषयवस्तु
एकाई १ सञ्चारात्मक नेपाली भाषा

१.१ भाष्पक भेदको परिष्कार
• मौखिक र लिखित
• ओपनचारिक र अनोपचारिक
• अभावक र मानक
• सामान्य र प्रयोजनपर्क (विशिष्ट) भेदको सोदाहरण परिष्कार

१.२ दैनिक कार्यमा प्रयोग हुने भाषाको ज्ञान र प्रयोग
• अनुशार तथा आदेश/निदेशन गर्न भाषाको ज्ञान र प्रयोग
• सोमै गरीने कामहरूमा प्रयोग हुने भाषाको ज्ञान र प्रयोग
• प्रश्नात्मक र वर्णात्मक भाषाको ज्ञान र प्रयोग

एकाई २ लेखन सीप

२.१ बोध, बुद्धिपोष, सज्जोपीकरण र संबंधितको ज्ञान र अभ्यास
• अनुसंधात लेखन
• संबद्ध लेखन
• बुद्ध लेखन
• सारांश लेखन
• पप्ट लेखन (निमन्बर नाम, पूर्ण, सम्पूर्ण, सम्पादकलाई चित्ररूप र निवेदन आदि)
• निवन्ध लेखन
• प्राविभिक तथा पारिवारिक शब्दहरूको ज्ञान र प्रयोग

2.2 शब्द निम्नको अभ्यास
• उपसंग
• व्याख्या, (कृति तथा लिखित)
• समार

2.3 प्राविभिक/पारिवारिक शब्दहरूको शब्दखोट,
• व्याख्यान (प्राविभिक शब्दका सन्दर्भमा आवश्यक मात्र)
• अर्थ र व्युत्पत्ति लागि शब्दहरूको प्रयोगको अभ्यास

2.4 प्रतिबद्ध लेखन

एकादश २ कृति परिचय
निम्न लिखित झाँचामा तलका कृतिको परिचय लेखने अभ्यास

३.१ कृतिको उजां
• सीर्य उजां
• ट्रेड कोश (कालाखंड तालिम) : एक परिचय : ३.३.सः. पश्चिमाञ्चल क्याम्पस रोक्स
• भुक्तका सुरक्षित रहन गर्नु पूर्व तयारी: भूक्रम प्रविभि गणितीय समाज नेपाल
• इंटरनेटीयर्ड नेपाली: लालानाथ सुखेली
• सिंचाई प्रविभि ज्ञान : भोजराज रेम्बी, वि. वि. पाठ्यक्रम विकास केन्द्र

३.२ कृति परिचयको बाणा
• कृतिको नाम:
• कृतिकारको नाम:
• कृतिका मुख्य विषय: (एक अनुच्छेद)
• कृतिको महत्व: (एक अनुच्छेद)
• कृतिले आफ्नैलाई पारेको प्रभाव : (छोटो एक अनुच्छेद)
• कृतिको भाषा शैली: (छोटो एक अनुच्छेद)
• कृतिको कम्य, कमजोरी र सुभाष: (छोटो एक अनुच्छेद)

सिकाइ सामग्रीहरू
• वि. वि. पाठ्यक्रम विकास केन्द्र, अनिवार्य नेपाली विज्ञान निर्देशन, काठमाडौं
• लालानाथ सुखेली, इंटरनेटीयर्ड नेपाली विज्ञानी पुस्तक भण्डार, भोटाहिटी, काठमाडौं।
• लालानाथ सुखेली, नेपाली व्याकरण, बोध / रचना (सम्बन्धित अंश मात्र) विभागी पुस्तक भण्डार, भोटाहिटी, काठमाडौं।
• गोरखपुर, कृतिकृति आदि पत्रिका समाधिकीय, दिपपरि र लेखरू।
• प्रारंभिककरून आफ्नी पुस्तक तयार गर्न बजारमा पाइने सामग्री छानेर पढाउन सक्ने, तर परीश्रम महाशाखालाई वस्त्रको पूर्व जानकारी दिनुपर्न।
Communication English

EG 1102 SH

Year: I
Semester: I

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

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

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

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

Course Contents:

Unit 1. Communicative English: [3]

1.1. The structure of English:
   • Introduction
   • Grammatical units:
     - The word
     - The phrase
     - The clause
     - The sentence
   • The grammatical structures:
     - The structure of the phrase
     - The structure of the clause
     - The structure of sentence (functions)
     - The structure of sentence (realizations)

1.2. Everyday functions.
1.3. Requests and offers.
1.4. Direct functions.
1.5. Asking about / expressing.
1.6. Asking about / stating.
1.7. Functions of English.
1.8. Using dictionary
1.9. Reading comprehension
1.10. Collection and definitions of trade related terminologies
Unit 2. Writing skills in English:

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

Unit 3. English sounds and structures:

3.1 Definitions of phonology, sounds of English, morphology, lexicology, syntax, and semantics
3.2 Sounds of English:
   - The vowels
   - The consonants
   - Consonant clusters
   - Vowel sequences
   - Syllable structure
   - Stress
   - Intonation

Unit 4. English conversation practices and guidance:

4.1 Situational conversation
4.2 Structural conversation
4.3. Familiarization with English spoken skills for employment during the stage of visa application to workstation in abroad.

4.4. Guidance for:
   - TOEFL preparation
   - EILTS preparation
   - Group discussion and presentation
   - Seminar conduction

**Reference Books :**

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

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 incircles and ex-circles of a triangle

Unit 2. Coordinate Geometry:

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 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: [8]
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. Calculus: [20]
4.1 Idea of set, set notations, set operations,
4.2 Venn diagram,
4.3 The set of real members and its subsets.
4.4 The absolute value of a real number.
4.5 Functions- algebraic and transcendental.
4.6 Graphs of simple function.
4.7 Limit of community.
4.8 Derivatives of simple functions from first Principle (by definition):
• $x^n$, $(ax+b)^n$, $\sin (ax +b)$, $e^{ax}$, $a^x$, and $\log x$.
4.9 Derivatives of sum, difference, product and quotient of functions, chain rule, parametric and implicit functions
4.10 Integration, Rules for finding integrals.
4.11 Standard integrals and their uses.
4.12 Definite integrals- definition and evaluation.
4.13 Definite integral as limit of sum.
Text Book


References

1. Elementary of Mathematics Vol I and II by Dal Bahdur Adhikari & Nir Shrestha
2. Certificate Mathematics by GD Pant
3. Elementary Engineering Mathematics, Diploma in Engineering by Hari Nandan & Parishwar Acharya
4. Intermediate Calculus Part I By GD Pant
Engineering Physics I
EG 1104 SH

Total: 6 hour /week
Year: I
Semester: I
Lecture: 3 hours/week
Tutorial: 1 hours/week
Practical: 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.
2. Heat and thermodynamics.
3. Optics.

Course Contents:
Unit 1. Mechanics:

1.1 Basic units and measurements:
- Measurement of physical quantities
- Introductory ideas about dimensions of physical quantities.
- Scalar and Vector: definitions and examples, dot and cross product of two vectors
- Composition and resolution of vectors.

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

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

1.4 Gravitation:
- Newton’s law of universal gravitation.
- Gravitational attraction of earth:
- Acceleration due to gravity.
- Variation of acceleration due to gravity with height, depth, and latitude.
- Motion of satellites:
  - Orbital velocity,
- Geostationary satellites.
- Weightlessness.

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

1.6. Simple harmonic motion (SHM):
- Simple harmonic motion and its characteristics.
- Period, frequency, and amplitude of simple harmonic motion.
- Speed and acceleration in simple harmonic motion.
- Energy of simple harmonic motion.
- Simple pendulum.

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

Unit 2. Heat and thermodynamics:

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

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

2.3 Thermal Expansion:
- Coefficients of linear, superficial and cubical expansions of solid and relation between them.
- Cubical expansion of liquids.
- Real and apparent expansions.
• Variation of density due to expansion.
• Barometric height correction.

2.4 Heat Transfer:
• Thermal conduction conductivity and determination of the coefficient of thermal conductivity.
• Convection and convection coefficient.
• Radiation.
• Perfectly black body.
• Stefan-Boltzman’s law of black body radiation.

2.5 Gas Laws:
• Boyle’s law,
• Charles law and ideal gas equation.
• Universal gas constant,
• Avogadro number and Boltzmann constant.
• Volume and pressure coefficients of ideal gas.

2.6 Kinetic Theory of Gases:
• Pressure in an ideal gas from molecular point of view.
• RMS speed, mean energy of a molecule of an ideal gas.

2.7 Thermodynamics:
• First law of thermodynamics.
• Different thermodynamic process:
  – Adiabatic,
  – Isothermal and
  – Isobaric.
• Specific and molar heat capacities for different thermodynamic processes, \( \Delta C_p - \Delta C_v = R \).
• Second law of thermodynamics.
• Carnot engine, Otto cycle and their efficiencies.

Unit 3. Optics:

3.1 Light and Illumination:
• Nature of light, sources of light, rays.
• Luminous s flux.
• Luminous intensity of a point source.

3.2 Reflection and Refraction by plane Surfaces:
• Review of reflection and refraction by plane surfaces.
• Speed of light in different media.
• Deviation due to reflection and refraction.
• Phenomenon of total internal reflection, critical angle.
• Real and apparent depth.
• Determination of reflective index.

3.3 Reflection by Spherical Surfaces:
• Review of reflection by spherical surfaces.
• Method of construction pf image by ray diagrams.
• Real and virtual images.
• Nature of images formed by spherical mirrors.
• Spherical aberration: parabolic mirror.
• Uses of Mirrors: driving mirror of a car, field of view.

3.4 Refraction through Prisms and Lenses:
• Deviation due to prism and minimum deviation.
• Refraction through lenses.
• Lens maker equation.
• Converging lens, diverging lens and thin lens equation.
• Formation of images by lenses.
• Combination of lenses.
• Magnification,
• Power of a lens.
• Uses of lenses:
  – simple microscope,
  – compound microscope and
  – Telescope
• Human eye.

4.1 Magnets and Magnetic fields:
• Magnetic poles, magnetic moment, magnetic axis, and magnetic meridian.
• Magnetic field.
• Coulomb’s law for magnetism.
• Magnetic field due to magnetic poles and bar magnets.
• Intensity and flux density of magnetic field.
• Neutral point.
• Tangent law.
• Deflection and oscillation magnetometer.

4.2. Earth’s Magnetism:
• Horizontal and vertical components of earth’s magnetic field.
• Declination and angle of dip.

4.3. Magnetic properties of materials;
• Molecular and modern theory of magnetism.
• Para magnetism and diamagnetism:
  – Permeability and
  – Susceptibility.
• Intensity of magnetization.
• Domain theory of ferromagnetism.
• Hysterisis
Engineering Physics Practical I

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.

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

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

Text book for laboratory work:
1. Physics Practical Guide by U.P. Shrestha, RPB

Text book for numerical problems:
1. Numerical exercise in physics volume I and volume II -
   Prepared by Physics Dept., Pulchowk Campus, and published by Institute of Engineering.
Engineering Chemistry I  
EG 1105 SH

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

Year: I  
Semester: I

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: General chemistry: 

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

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

1.3 Molecular Weight:  
- Definition  
- Avogadro's hypothesis  
- Application of Avogadro's hypotheses (Mol. Wt=2×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

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

1.5 Simple mole concept:
• Mole of an atom
• Mole of a molecule
• Molar volume and
• Simple calculation on mole concept

**Unit: 2: Language of chemistry:**

2.1 Symbol:
• Definition
• Significance (qualitative and quantitative)

2.2 Formula:
• Definition
• Significance (qualitative and quantitative)
• Concept of valency in terms of combining capacity with H₂, O₂, and Cl₂
• Variable valency (ref. Fe, Sn, Pb, Cu, Hg, S and N)
• Radicals (electro- positive and electro - negative)
• Writing a formula

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

**Unit: 3: System of classification:**

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

3.2 Electronic theory valency:
• Assumptions
• Types
• Electrovalency eg. NaCl, MgO, CaS
• Covalency eg. 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

3.3 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

3.4 Periodic table:
• Mendeleef's periodic law
• Mendeleef's periodic table
• Characteristics of groups and periods in the table
• Advantages and anomalies of the periodic table
• Modern periodic law

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

3.6 Activity and electrochemical series:
• Definition,
• Action of water, acid and oxygen on metals.

3.7 Corrosion:
• Definition
• Types
• Direct and indirect method and prevention against corrosion

3.8 Acid, Base and Salt:
• Arrhenius concept of acid and base
• Lowry and Bronsted concept of acid and base
• Conjugate acid and base
• Amphoteric nature of water
• Lewis concept of acid and base
• Preparation of acid and base (at least 2 -methods).
• Properties of acid and base.
• Definition of Salt
• Types of salt (normal, acidic and basic)
• Preparation of salt (at least 3 - methods)
• Concept of hydrogen ion concentration, pH value and pH Scale
• Buffer solution.

3.9 Volumetric analysis:
• Definition of titration (acidimetry and alkalimetry),
• Indicator
• End-point (neutralization point)
• Standard solution (primary and secondary standard solution), Normal, Decinormal, Molar, Molal solution
• Requisites of primary standard substance
• Volumetric equation,
• Express the strength of solution Normality, Molarity, Molality, gram per litre and percentage and related numerical problems

**Engineering Chemistry Practical I**

1. **Simple Glass Working**
   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

3. To separate sand and calcium carbonate in pure and dry state from the mixture of sand and calcium carbonate

4. To prepare pure water from supplied impure water by distillation and test the purity of the sample prepared

5. To neutralize dilute sulphuric acid with sodium carbonate solution, and to recover crystals of sodium sulphate

6. To obtain pure and dry precipitate of barium sulphate by treating excess of dilute sulphuric acid with barium chloride solution

7. To investigate the composition of water by electrolysis by using Hofmann’s apparatus

8. To determine the equivalent weight of reactive metal by hydrogen displacement method.

9. To determine the pH of different unknown solution and using pH paper and universal indicator

10. To prepare primary standard solution of sodium carbonate and to use it to standardize an approximate decinormal acid solution

11. To standardize given unknown acid (Approx N/10) solution by preparing standard alkali solution. (Expression of strength in different ways)

12. To standardize given unknown alkali (approximately N/10) solution with the help of preparing standard acid solution. (Expression of strength in different ways)

13. To carry out conductivity experiments on solids and liquids (CuSO4, Zn, Mg, Al, Fe, CCl4, C6H6, C2H5OH)

**Text books:**
1. *A Text book of Chemistry, Jha and Guglani*

**Reference books:**
1. *Fundamentals of Chemistry, K.R. Palak*
2. *Inorganic Chemistry, Bahl and Tuli*
4. *A Textbook of Inorganic Chemistry, L.M. Mitra*
5. *Elementary practical chemistry, M.K Sthapit*
Survey Drawing I  
EG 1106 GE

Course Description:
This course consists of fundamental concept of manual drawing skills 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 and understand map symbols (point, line and area symbol)
- Enlarge and reduce a map fragment
- Understand the techniques of map copying

Course Contents:
Unit 1: Introduction [2hrs]
1.1 Definition of Drawing
1.2 Engineering and Survey Drawing
1.3 Uses of Drawing
Unit 2: Equipments and Materials [3hrs]
2.1 Introduction
2.2 Different types of (Manual) Drawing Equipments and Materials (Media)
2.3 Uses of Drawing Equipments and Materials
2.4 Quality of Drawing Materials and Ink
2.5 Maintenance and Care of Drawing Equipments
2.6 Choice of Appropriate Drawing Equipments and Materials

Practical:
1 Demonstration of Different Drawing Equipments and Materials [4hrs]

Unit 3: Geometrical Drawings [2hrs]
1.1 Introduction
1.2 Plane Figures (Regular and Irregular)

Practical:
1 Construct Triangles for each type (Equilateral, Isosceles and Scalene) [4hrs]
2 Construct Quadrilaterals for each type (Square, Rectangle, Rhombus, Trapezoid) [4hrs]
3 Construct Regular Polygons for each type (Pentagon, Hexagon, Heptagon, Octagon) [6hrs]
4 Divide a given straight into any number of equal parts [3hrs]
Unit 4: Drawing Techniques [5 hrs]

3.1 Types and Sizes of Letters
3.2 Devnagari and Roman Letters
3.3 Mechanical Lettering: Lettering Sets
3.4 Different Types of Lines
3.5 Format of Grid Sheet and Margin
3.6 Scales: Types, Construction and Use
3.7 Graphical) Enlargement and Reduction of Map Scale
3.8 Conventional Signs and Symbols
3.9 Types of Charts: Bar Diagram, Pie-diagram (Pie-Chart)

Practical:
1. Write 2 Full Pages Devanagari Letters of different sizes [10hrs]
2. Write 2 Full Pages Roman Letters of different sizes [8hrs]
3. Write 1 Full Page using Lettering Set [4hrs]
4. Draw different line types with different thicknesses [4hrs]
5. Construct a Grid (Square) in A4 size paper by hand [4hrs]
6. Construct Plain Scale (Single line and Double line) [4hrs]
7. Construct Diagonal Scale [4hrs]
8. Draw different Symbols used in Cadastral and Topographic maps of Nepal [16hrs]
9. Trace a fragment of a Cadastral Map (A4 size Paper) [4hrs]
10. Enlarge and Reduce a piece of Cadastral Map (Graphically) [4hrs]
11. Prepare Bar diagram and Pie-Diagram from the given Data [4hrs]

Unit 5: Freehand Sketching [1hrs]

2.1 Introduction
2.2 Sketching Materials
2.3 Proportion; Estimation of Distance and Direction
2.4 Use of Sketching in Surveying and Mapping

Practical:
1. Prepare a Freehand Sketch of the given area (School Compound) and Ink [2hrs]

Unit 6: Copying [2hrs]

4.1 Introduction
4.2 Ammonia Printing

Practical:
1. Perform an Ammonia printing of a Cadastral Map [6hrs]

Reference Book
2. Engineering Drawing Volume 1 and 2 by K.R. Gopalkrishna
4. Basic Cartography Vol I, International Cartographic Association
5. Elements of Cartography, H. Robison
6. Cartography for Mapping, Rabin Kaji Sharma
Survey Instruments I
EG 1107 GE

Year: Total: 12 hours/week
Semester: I Lecture: hours/week
Tutorial: 2 hrs/week
Practical: 10 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
  Ranging Lines and Offsets on the earth’s surface.
- be able to use instrument for surface distance measurements on the earth’s
  surface.
- be able to explain the elements of Direction measurements and Bearings.
- Be acquainted with and be able to explain the use of magnetic compass
- be acquainted with and be able to explain the use of conventional graphical
  surveying instrument- The plane table and accessories
- be skilled in carrying out various land surveying tasks using Plane Tabling
  equipments.

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 related with 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, and relevant solution of practical/numerical problems

Course Contents:

Unit 1: Ranging Instruments (15hrs+25hrs)
  1.1 Pegs and Ground Marks
  1.2 Ranging Pole
  1.3 Plumb Bob
  1.4 Line Ranger
  1.5 Cross Staff
  1.6 Optical Square

Unit 2: Distance Measuring Instruments (15hrs+25hrs)
2.1 Surveyor’s Chain
2.2 Measuring Tape

Unit 3: Direction and Compass (15hrs+35hrs)
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
   • Magnetic Declination
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

Unit 4: Graphical Surveying Instruments (15hrs+35hrs)
4.1 Plane Table
4.2 Sight Rule
4.3 Telescopic Alidade and Staff
4.4 Indian Clinometer

Reference Books
1. Surveying Vol. I Dr. B.C Punmia, Laxmi Publication Pvt.Ltd
3. Principles and use of Surveying Instruments, J. Clendinning, J.G Oliver
Second Semester

EG1201SH  Communicative English II
EG1202SH  Social Studies
EG1203SH  Engineering Mathematics II
EG1204SH  Engineering Physics II
EG1205SH  Engineering Chemistry II
EG1206GE  Computer Application
EG1207GE  Survey Instruments II
Communicative English II
EG1202SH

Year: I  Lecture: 2 hours/week
Semester: II  Tutorial: hours/week
Practical: hours/week

Total: 2 hour/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:
5. Communicate in English language at work/job environment
6. Define and use trade related technical terminologies
7. Demonstrate various writing skills related to the job
8. 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]
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]
• Surveying & Mapping
• Geomatics
• Remote Sensing and GIS
• Land Management

Test and revision [5]
Reference Books:
2. Shah B.L., A text book of writing skills in English, First edition Hira Books Enterprises, Kathmandu,
सामाजिक अध्ययन
(EG 2206 SH)

Year: II
Semester: II

कोष्ठको परिचय

यस पाठ्यमा विद्यार्थीहरूले सामाजिक विशेषताहरू, मानव र समाजसंग भएका विभिन्न सम्बन्धहरू, सामाजिक तथा सांस्कृतिक परिवर्तन सम्बन्धी कार्यहरू, बातचीत र पयारक्रम, समाजसेवा र सामुदायिक विकास एकाइहरू, सामाजिक अनुसन्धान, गामीण शोधहरू, नेपालको उत्पादक नेपालको कुराहरू र आधिक अवस्था, परराष्ट्रीयता तथा शासन व्यवस्था र जनसंख्या शिखाउसामग्री क्रमबाट इकाईहरू समावेश गरिएका छन्।

कोष्ठको उद्देश्य:

यस पाठ्यांशको अध्ययनबाट विद्यार्थीहरूले निम्नलिखित कुरा सक्नेछन्–

१. सामाजिक विशेषताहरूको व्याख्या गन्न,
२. मानव र समाजसंग भएका विभिन्न सम्बन्धहरूको चरण गन्न,
३. सामाजिक तथा सांस्कृतिक परिवर्तन सम्बन्धी कार्यहरूको व्याख्या गन्न,
४. बातचीत र पयारक्रमको व्याख्या गन्न,
५. समाजसेवा र सामुदायिक विकासको व्याख्या गन्न,
६. सामाजिक अनुसन्धानका कार्य गन्न,
७. गामीण शोधहरू पहिचान गन्न,
८. नेपालको उत्पादक नेपालको आधिक अवस्था, परराष्ट्रीयता तथा शासन व्यवस्थाको व्याख्या गन्न
९. जनसंख्या शिखाउको बयान गन्न,

पाठ्यांशको विषयवस्तु

१. सामाजिक विज्ञान (Social Science)

(क) समाजशास्त्र र गामीण र समाजशास्त्रको परिचय
(ख) समाजशास्त्रको प्रकृति र वैज्ञानिक पद्धति
(গ) সামাজিক বিজ্ঞান র ভৌতিক বিজ্ঞান বিচক্ষণ অন্তর

(ঘ) বিজ্ঞান র ইন্জিনিয়ারিং

(ঃ) বিজ্ঞান র প্রবিধি

(চ) বিজ্ঞান র ধর্ম

(ছ) বিজ্ঞান র সমাজ

২. মানব র সমাজ (Man and Society)

(ক) সমাজ, সংস্কৃতি র ব্যক্তিত্ব, বাংলা, পরম্পরা র ফেশন

(খ) জাতি, ভাষা, ধর্ম, পেশার রহনসহন

(গ) সামাজিক বর্গ ব্যবস্থা

(ঘ) সমাজমাত্র মহিলা হরকে স্থাপন

৩. সামাজিক তথা সাংস্কৃতিক পরিবর্তন (Social Cultural Changes)

(ক) সামাজিক তথা সাংস্কৃতিক পরিবর্তনকারী অর্থ

(খ) সামাজিক তথা সাংস্কৃতিক পরিবর্তনকা সংঘালীনতার

(গ) সামাজিক পরিবর্তনকা বিশেষতার

(ঘ) সামাজিক তথা সাংস্কৃতিক পরিবর্তনকা কারক তত্ত্ব

(ঙ) ওষোধীকরণ র সামাজিক পরিবর্তন

(চ) গ্রামীণ সামাজিক পরিবর্তন

(ছ) ওষোধীকরণ র গ্রামীণ সমাজকা লক্ষণহর

(জ) শাহীকরণ

৪. বাতাসবরণ র পর্যায়বরণ (Environment and Ecology)

(ক) বাতাসবরণ র পর্যায়বরণকো অর্থ

(খ) বাতাসবরণ পর্যায়বরণ সংস্কৃতকো আবশ্যকতা র মহত্ত্ব

(গ) বাতাসবরণ র কাননকো সামান্য ইতিহাস

৫. সমাজ সেবা র সামুদায়িক বিকাস (Social Services and Community Development)

(ক) সামুদায়িক বিকাস পরিযোজনাকো অর্থ র উদ্দেশ্য
(ख) सामुदायिक विकास कार्यक्रम
(ग) जनसहभागिता र सामुदायिक विकास
(घ) समाज सेवाको अर्थ, क्षेत्र र उद्देश्य
(ड) सामाजिक कार्यकर्ताको अर्थ, प्रकार, गुण र भूमिका

6. सामाजिक अनुसन्धान (Social Research)
(क) परिभाषा, प्रकृति, उद्देश्य र प्रकार
(ख) सामाजिक अनुसन्धानका प्रेरककार
(ग) सामाजिक अनुसन्धानका प्रमुख चरण

7. ग्रामीण श्रोतहरू (Rural Resources)
(क) मानवशक्ति
(ख) जलश्रोत
(ग) भूमि
(घ) जनसम्पदा
(ड) खनिजशक्ति
(च) सौयंशक्ति
(छ) वायुशक्ति

8. नेपाल शब्दको उत्पत्ति (Origin of Nepal Word)

9. विश्व मानचित्रमा नेपाल (Nepal in the World Map)

10. आर्थिक अवस्था (Economic System)
(क) कृषि, व्यापार, उद्योग, यातायात र सञ्चार
(ख) आर्थिक व्यवस्थाका विशेषताहरू

मिश्रित अर्थ व्यवस्था, साभा, योजनावाद विकास, कृषिजन्य अर्थ व्यवस्था

11. परराष्ट्रीय नीतिः (Foreign Policy)
(क) नेपाल असलम्य परराष्ट्रीय नीतिको अर्थ
(ख) नेपालको पर्राप्त-नीतिका विशेषताहरू
(ग) नेपाल भारत सम्बन्ध
(घ) नेपाल चीन सम्बन्ध
(ड) संयुक्त राष्ट्र संघ र नेपाल
(च) सार्क र नेपाल

12. शासन र व्यवस्था (Ruling System)

(क) व्यवस्थापिका
(ख) कार्यपालिका
(ग) न्यायपालिका
(घ) संविधान
(ड) नेपाल अधिराज्यको संविधान र यसका विशेषताहरू
(च) विक्रेत्रीकरण, महत्त्व, आवश्यकता र विशेषताहरू

13. जनसंख्या शिक्षा (Population Education)

(क) जनसंख्या शिक्षाको परिचय र विविधता
(ख) जनसंख्या शिक्षाको उद्देश्यहरू
(ग) जनसंख्याको आकार, संरचना, वितरण, बृद्धि, प्रभाव र नियन्त्रण

सन्धर्म सामग्री:

1. आधारभूत सामाजिक स्तर तथा मानवयुग, कमतराज शर्मा, देवी शर्मा, पोखरा।
2. अर्थशास्त्रका तत्त्वहरू, साबित्री श्रेष्ठ, अशोक प्रकाश, काठमाडौं, दोधी संस्करण।
3. अर्थशास्त्रका सरल सिद्धान्त, इंग्लिशमान श्रेष्ठ, अशोक प्रकाश, काठमाडौं।
4. अर्थशास्त्र, मुरारिमाहन जोशी, कृष्णदेव वादव, नेपालको बुक सेंटर, काठमाडौं।
5. महत्त्वपूर्ण राजनीतिक शास्त्रात, सिद्धिवर्गमान श्रेष्ठ, अशोक प्रकाश, काठमाडौं, नेपालको नेपालको संस्करण २०५३।
6. मुद्रा, वैशिष्ट्य, अर्थशास्त्र, अन्तरराष्ट्रीय व्यापार तथा नेपालको अर्थशास्त्र, राजेन्द्रलाटर्मान श्रेष्ठ, रतन पुस्तक प्रेस, काठमाडौं।
7. नेपाल परिचय, साबित्री श्रेष्ठ, सिद्धिवर्गमान श्रेष्ठ, निर्मल प्रकाश, काठमाडौं, नेपालको संस्करण।
8. राजनीतिक शास्त्रको परिचय सिद्धिवर्गमान श्रेष्ठ, निर्मल प्रकाश, काठमाडौं, दोधी संस्करण।
9. सामाजिक अभियान, राजेन्द्रलाटर्मान अधिकारी, सह-प्राप्त, सिद्धिवर्गमान श्रेष्ठ, अशोक प्रकाश, काठमाडौं।
Engineering Mathematics II
EG 1201 SH

Year: I
Semester: II

Total: 4 hour/week
Lecture: 3 hours/week
Tutorial: 1 hour/week
Practical: 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: [5]

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:

2.1. Complex number in the from A+ ib.
2.2. Algebra of complex numbers.
2.3. Polar representation of complex numbers.
2.4. De Moivre’s theorem and its applications
2.5. Linear inequalities and their graphs.
2.6. System of linear inequalities in two variables,
2.7. System of linear inequalities in two variables,
2.8. Linear programming: Problems involving two variables under given linear constraints
2.9. Determinants and matrices,
2.10 Algebra of matrices,
2.11 Properties of determinants,
2.13. Solution of linear equations using cramers' rule
2.14. Row equivalent matrices
2.15. Idea of polynomial equations

Unit 3. Calculus:

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 Anti-derivatives:
- Curve tracing, maxima and minima
- Riemann sums & integral
- Application of fundamental theorem

Unit 4. Geometry:

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

Unit 5. Statistics:

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
- Concept of theoretical probability distribution
5.3 Concept of normal curve and normal distribution
5.4. Concept of sampling, estimation and tests of significance
**Text Book**

**References**
2. *Statistical Methods* – Mrigendralal Singh
4. *Certificate Mathematics* by GD Pant
6. *Intermediate Calculus Part I* By GD Pant
Engineering Physics II
EG 1202 SH

Year: I
Semester: II

Total: 6 hour/week
Lecture: 3 hours/week
Tutorial: 1 hour/week
Practical: 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.
- Mechanical measurements:
  - Galvanometer.
  - Ammeter and voltmeter
  - Potentiometer and measurement of emf.
  - Whitestone bridge
  - Kirchhoff’s law and their use to analyze simple circuits.
- Heating effect of current:
  - Joules law
  - The rate of heating from the concept of p.d.
- Thermoelectricity:
  - See-beck effect
  - Peltier effect and
  - Thomson effect.
- Chemical effect of current:
  - Faraday’s law of electrolysis.
  - Accumulator.

1.3. Magnetic effect of current and electromagnetism:

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

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

Unit 2. Waves: [9]

2.1. Wave motion:

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

2.2. Wave phenomena:

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

2.3. Physical optics:

• Interference of light waves and coherent sources.
• Phase difference and path difference. Young's double slit experiment.
• Distraction of light waves.
• Huygen's principle.
• Polarization and unpolarized lights, polarization by reflection (Brewster's law)

Unit 3. Properties of matter: [10]

3.1 Elasticity:

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

3.2 Surface tension:

• Intermolecular attraction in liquid, surface tension.
• Cohesion and adhesion, angle of contract.
3.3 **Viscosity:**

- Stream line and turbulent flows.
- Idea of liquid layer, Velocity gradient, Viscosity and its coefficient.
- Comparison of viscosity with solid friction, Viscous forces, Stoke's law, Terminal velocity, determination of coefficient viscosity, Viscous forces at higher relative velocities (qualitative).
- Temperature dependence of the coefficient of viscosity of liquid and gases.

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

#### 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, transistor action and uses of npn transistor

#### 4.3 **Nuclear physics:**

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

### 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.

**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

**Supplementary text:**
1. College Physics by sears, Zemansky and Young, Fourth edition 1985

**Text book for laboratory work:**
1. Physics Practical Guide by U.P. Shrestha, RPB

**Text book for numerical problems:**
1. Numerical exercise in physics volume I and volume II -
   Prepared by Physics Dept., Pulchowk Campus, and published by Institute of Engineering.
Engineering Chemistry II
EG 1203 SH

Year: I
Semester: II

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

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

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

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

Course Content:

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

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

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

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

1.5 Hydrochloric acid:
- Lab preparation
- Properties and uses

1.6 Hydrogen Sulphide:
- Lab preparation
- Properties and uses

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

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

Unit 2: Metals and their compounds:

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

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

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

2.4 Aluminum:
- Properties and uses

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

2.6 Zinc:
- Properties & uses

2.7 Iron:
- Properties & uses
2.8 Lead:
  • Properties & uses

2.9 Alloys:
  • Definition
  • Purpose of making alloys
  • Composition,
  • Properties and uses of alloys of steel, aluminum, copper and zinc

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

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

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

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, \( \text{H}_2\text{SO}_4\) (dil.)& \( \text{HNO}_3\) (dil) [2]
5. To prepare and study the properties of hydrogen gas [2]
6. To prepare and study the properties of ammonia gas [2]

7. To prepare and study the properties of hydrogen Sulphide gas. (This gas should not be prepared individually in a Woulf bottle but in Kipp's apparatus commonly) [2]

8. To detect the acid radicals (Cl⁻, NO₃⁻, SO₄²⁻, CO₃⁻) by dry and wet ways (4)

9. To detect the basic radicals (Cu²⁺, Al³⁺⁺, Fe³⁺⁺, Zn²⁺, CO²⁺, Ni²⁺, Ca²⁺, Ba²⁺, Mg²⁺) by wet ways [6]

10. To detect the acid and basic radicals (complete salt analysis) [6]

Text books:
2. A text Book of chemistry, Jha & Guglani
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
Computer Applications  
EG1206GE

Year: II  
Semester: II  

Course Description:
The course contains the basics of computer science covering history of computer science, basic computer architecture, data representation, fundamentals of programming and computer applications.

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. Basic Concepts of Computer Technology
2. Uses of Computer Technology
3. Fundamentals of Programming
4. Applications of Computer programme.

Course Contents:

Unit 1. Introduction to Computer Science [3 hrs]

1.1. Features of Computer
   • Introduction to Computer
   • Features

1.2. History of Computer Science
   • Overview
   • Different Inventions (Abacus, Napier Bone, Slide Rule, Pascaline, Difference Engine, Analytical Engine, Hollerinth’s table)
   • Generations of Computer

1.3. Application Fields of Computer

1.4. Classification of Computers
   • Purpose (General and Specific)
   • Data Handling (Analog, Digital and Hybrid)
   • Functionality (Micro, Mini, Main Frame and Super Computers)

Unit 2. Basic Computer System [2 hrs]

2.1. Overview

2.2. Central Processing Unit
   • Arithmetic and Logic Unit
   • Control Unit

2.3. Memory
   • Primary Memory
   • Secondary Memory
   • Cache

2.4. Input and Output Devices
   • Basic Devices
   • Printers

2.5. Hardware and Software
Unit 3. **Data Representation** [5 hrs]

3.1. Overview
3.2. Types
   - Integers
   - Real Numbers
   - Strings
   - Bits and Bytes
3.3. Fixed and floating point number representation
3.4. Computer Number System
   - Decimal Number System
   - Binary Number System
   - Octal Number System
   - Hexadecimal Number System
   - Conversion from one Number System to another
   - Binary Number Addition, Subtraction, Multiplication and Division

Unit 4. **Microsoft Windows and User Interface** [3 hrs]

5.1. Overview
5.2. Components (Desktop, Taskbar, Icons, My Computer, Start Button, Programs, Window Control Buttons, Menus and dialog boxes, File Management)
5.3. DOS(Disk Operating System) Overview

Unit 5. **Word Processor (Microsoft Office)** [4 hrs]

6.1. Overview
6.2. Starting MS-Word
6.3. Components of MS-Word Window
6.4. Navigating through a document
6.5. Editing Text
6.6. Clipboard
6.7. Formatting Text
6.8. Printing a document
6.9. Saving a file

Unit 6. **Spread Sheets (Microsoft Excel)** [6 hrs]

7.1. Overview
7.2. Starting MS-Excel
7.3. MS-Excel Toolbars
7.4. Creating a worksheet
7.5. Organizing data
7.6. Designing the worksheet
7.7. Working with formulas
7.8. Chart and Data Analysis
7.9. Printing worksheet

Unit 7. **Fundamentals of Programming** [6 hrs]

7.1. Overview
7.2. Program Development Cycle
7.3. Algorithm Development
   - Overview
• Rules
7.4. Flowcharts
• Overview
• Symbols
• Rules
7.5. Pseudocode and its applications

Unit 8. Security and Viruses [3 hrs]
9.1. Overview
9.2. Hardware Security
9.3. Software Security
9.4. Computer viruses, types and their symptoms
9.5. Anti-Virus Software

Unit 9. Internet and e-mail [3 hrs]
10.1. Overview
10.2. Terms related to Internet
10.3. Basic Components required for Internet Connection
10.4. e-mail

Test and Revision [10 hrs]
COMPUTER APPLICATION PRACTICAL / Total hours: 75

Course Contents:

Unit 10. **Computer Applications** [3 hrs]
1.1. Demonstration of different type of computer applications

Unit 11. **Basic Computer System** [3 hrs]
2.1. Hardware Demonstration
   - Central Processing Unit
   - Memory and types of memory (Primary and Secondary memories)
   - Input and output devices
   - Printers

Unit 12. **Data Representation - Exercise** [10 hrs]
3.1. Decimal, Binary, Octal and Hexadecimal number system
3.2. Fixed and floating point number representation
3.3. Computer Number System
   - Decimal Number System
   - Binary Number System
   - Octal Number System
   - Hexadecimal Number System
   - Conversion from one Number System to another
   - Binary Number Addition, Subtraction, Multiplication and Division

Unit 13. **Fundamentals of Programming - Exercise** [15 hrs]
4.1. Algorithm Development
4.2. Flowcharts
4.5. Pseudocode

Unit 14. **Microsoft Windows and User Interface** [10 hrs]
5.1. Components (Desktop, Taskbar, Icons, My Computer, Start Button, Programs, Window Control Buttons, Menus and dialog boxes, File Management)
5.3. DOS (Disk Operating System)

Unit 15. **Word Processor (Microsoft Office)** [10 hrs]
6.1. Starting MS-Word
6.2. Components of MS-Word Window
6.3. Navigating through a document
6.4. Editing Text
6.5. Clipboard
6.6. Formatting Text
6.7. Printing a document
6.8. Saving a file

Unit 16. **Spread Sheets (Microsoft Excel)** [15 hrs]
7.1. Starting MS-Excel
7.2. MS-Excel Toolbars
7.3. Creating a worksheet
7.4. Organizing data
7.5. Designing the worksheet
7.6. Working with formulas
7.7. Chart and Data Analysis
7.8. Printing worksheet

Unit 17. **Security and Viruses** [2 hrs]
9.1. Computer viruses, types and their symptoms
9.2. Anti-Virus Software

Unit 18. **Internet and e-mail** [2 hrs]
10.1. Internet
10.2. Internet Connection
10.3. e-mail

Test and Revision [5hrs]

**Reference Books**
1. *Introduction to Computer Science, Pearson Publication*
2. *A First Course in Computers, Sanjay Saxena, Vikash Printing House Pvt. Ltd, India*
3. *Manual for MASTERS IN COMPUTER APPLICATIONS, Hemanta Baral*
Survey Instruments II  
EG 1207 GE

Year: I  
Semester: II  
Total: 12 hrs/week  
Lecture: hrs/week  
Tutorial: 2 hrs/week  
Practical: 10 hrs/week

Course Description:
This part of the course deals with Direction measuring instrument- THEODOLITE, Subtense Bar measurement of Distance, Heighting Instruments, EDM and Total Station

Course Objectives:
After the completion of this course, the students will
• be acquainted with and be able to explain the requirement of Horizontal and Vertical/ Zenithal angles in surveying
• be able to operate various kinds of Theodolites for angle measurements
• be able to use Subtense method of distance measurements on the earth’s surface
• be acquainted with and be able to explain the use of Electronic Distance Meters and Total Stations
• be able to use various instruments- LEVELS for differentiating heights on the earth’s surface

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 related with 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, and relevant solution of practical/numerical problems

Course Contents:

Unit 1: Direction Measuring Instrument- Theodolites  
1.1 Theodolite and accessories  
1.2 Micrometer Optical Theodolite  
1.3 Digital/Electronic Theodolite  
(25 hrs +35 hrs)

Unit 2: Distance Measuring Instruments  
2.1 Theodolites and Staff  
2.2 Theodolite and Subtense Bar  
2.3 Electronic Distance Meters (EDM)  
(25 hrs +25 hrs)

Unit 3: Total Station  
(4 hrs+6hrs)

Unit 4: Heighting Instruments  
(25 hrs +35 hrs)
4.1 Hydrostatic Level
4.2 Simple spirit level
4.3 Abney Level
4.4 Altimeter
4.5 Levelling instruments and accessories
   • Dumpy Level
   • Tilting Level
   • Automatic Level
   • Digital/Electronic Level

**Reference Books**

3. *Principles and use of Surveying Instruments*, J. Clendinning, J.G Oliver
Second Year
(Semester II & III)
Third Semester

EG2101SH  Applied Mathematics & Statistics
EG2102GE  Fundamental of Surveying
EG2103GE  Control Surveying I
EG2104GE  Cartography
EG2105GE  Survey Drawing II
### Diploma in Geomatics Engineering
#### Curriculum Structure- Second Year/ First Part

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**Total:**
- Theory Asst. Marks: 360
- Theory Final Marks: 180
- Theory Total Hours: 120
- Practical Asst. Marks: 100
- Practical Final Marks: 100
- Practical Total Hours: 200

**Total Marks:** 750
Applied Mathematics
EG2101GE

Total: 4 hour/week
Lecture: 3 hours/week
Tutorial: 1 hours/week
Practical: 0 hours/week
Lab: 0 hours/week

Course Description:

This course covers the application of mathematics in the area of surveying and mapping. This includes fundamental of group theory, application of derivatives, differential equations and numerical methods.

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.
- Derive equation of parabola ellipse and hyperbola and find tangent and normal to the parabola.
- Define differential equations and different forms of solutions and use in application.
- Determine a root equations by numerical methods and
- Evaluate integrals by trapezoid and Simpson’s rules.

Course Contents

Unit -1 Elementary group theory 10 hrs
- Binary operation,
- Binary operation on sets of integers and their properties,
- Definition of a group
- Groups whose elements are not numbers,
- Uniqueness of identity, uniqueness of inverse,
- Cancellation law,
- Abelian group.

Unit -2 Application of derivatives 5 hrs
- L-Hospital rule (for 0/0, \( \infty/\infty \)),
- Differentials, tangent and normal,
- Geometric interpretation and application of Roll’s theorem and Mean value theorem.
Unit -3 Differential equation 5 hrs
- Differential equation and its order and degree,
- Differential equations of first order and first degree,
- Differential equations with separable variables,
- Homogeneous and exact differential equations

Unit – 4 Computational Method 10 hrs
- Introduction to numerical computing
- Number System
- Basic Arithmetic of Various number system
- Approximation Errors in Numerical methods
- Measurement of errors

Unit -5 Numerical Integration 10 hrs
- Definite Integral and Area Computation
- Introduction
- Trapezodial Rule
- Estimation of Errors
- Simpson’s rules
- Estimation of errors

Test and Revision 5 hrs

Reference books
1. Higher Secondary Level Mathematics Vol II by Bajrachara B.C. RM Shrestha et.al, Sukunda Pustak Bhawan
2. Element of mathematics Part II, D.B Adhikari and et.al, Himalaya Books Stall
Fundamental of Surveying  
EG 2102 GE

Year: I  
Semester: II  
Total: 10 hrs/week  
Lecture: 3 hrs/week  
Tutorial: 1 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  
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  
2.1 Surveying and Mapping, Geomatics  
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;  
• Geodesy;  
• 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, Normal;  
• Geodetic Tables;  
• Projection;  
• Relief representation
2.7 End products of surveying

Unit 3: **Principles and Classifications** 2 hrs
3.1 Basic Principles of surveying
3.2 Classification of Surveys: basis of classification and types of surveys

Unit 4: **Measurement Units** 3 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** 5 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

Unit 6: **Linear Measurements** 10 hrs
6.1 Introduction and Principles
6.2 Slope, Horizontal and Vertical distances
6.3 Distance measuring instruments
6.4 Ranging, Chaining and Obstacles in chaining
6.5 Errors in Chaining
6.6 Linear surveying (Chain surveying)
6.7 Optical Distance Measurement
6.8 Electronic Distance Measurement

Unit 7: **Angular Measurements** 10 hrs
7.1 Principle of direction measurement
7.2 Angles and Bearings
7.3 Compass Survey: Fieldwork procedure and plotting
7.4 Horizontal and Vertical angles
7.5 Theodolites Survey
7.6 Field procedures for angular measurement by Theodolite
7.7 Errors and Adjustments in Theodolite observations

Unit 8: **Map Reading** 4hrs
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,

Unit 9: **Measurement Errors** 6 hrs
9.1 Introduction
9.2 Significant figures
9.3 Sources of errors
9.4 Types of Errors
9.5 Precision and Accuracy
9.6 Propagation of Errors
9.7 Errors: Precautions and Adjustments

Revision and Tests 10hrs

Reference Books
1. Fundamental of Surveying by S.K Roy
2. प्रमाणीक नापी मापावर भुवनेशी (जि वि वि /या वि फोटो)
3. Principles and use of Surveying Instruments, J. Clendinning, J.G Oliver
4. Introduction to Surveying, by Anderson & Mikhail
6. Surveying Handbook – Brinker and Minnick. CBS Publication of India
FUNDAMENTAL OF SURVEYING PRACTICAL

Unit 1: Chain survey (Field work and Plotting) 20hrs
Unit 2: Compass Survey (Field work and Plotting) 20hrs
Unit 3: Measurement of angles using Theodolites by different methods 20hrs
Unit 4: Map Reading 15hrs
Unit 5: Map coordinates exercises 15hrs
Control Surveying I  
EG 2103 GE

Year: II  
Semester: I  
Total: 11 hrs/week  
Lecture: 2 hrs/week  
Tutorial: 1 hrs/week  
Practical: 8 hrs/week

Course Description:
This subject deals with methods of establishing horizontal and vertical controls, Theodolite Traversing and Levelling, which are mostly used 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 mapping
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. Understand different sources of error and their adjustment in leveling and traversing.

Course Contents:
Unit 1: Levelling
1.1 Introduction 4hrs
   • Introduction & Principle of leveling
   • 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
   • Principles of levelling
   • Levelling instruments and accessories
1.2 Methods of Levelling 6 hrs
   • Classification of levelling: Spirit, barometric, hydrostatic, trigonometric, hypsometric, GPS
   • Methods of leveling: Simple Levelling, Differential Levelling, Check Levelling, Fly Levelling, Reciprocal Levelling, Precise Levelling, Profile Levelling, Cross Sectioning
1.3 Field Procedure 10 hrs
   • Testing levels and Checking collimation error,
   • Reconnaissance, Monumentation,
   • Observation
   • Recording
   • Computation
   • Precautions to be taken in the field
### Unit 1: Errors and Adjustment in Levelling

- Types of error
- Sources of error
- Permissible error in different order of levelling
- Adjustment

### Unit 2: Traverse

#### 2.1 Introduction

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

#### 2.2 Method of traversing

- 2.2.1 Chain Traverse,
- 2.2.2 Compass Traverse,
- PT Traverse,
- Stadia Traverse and Theodolite Traverse
- Traverse Route: Open and Closed

#### 2.3 Field procedure

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

#### 2.4 Error and Adjustment in Traverse

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

### Unit 3: Revision and Test

- Revision and Test

### 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.
4. *Levelling Instruction Book*, Survey Department of Nepal
5. *Tringulation Instruction Book*, Survey Department of Nepal
Control Surveying I - Practical

LEVELLING PRACTICAL

Field work

Unit 1: Collimation Checking 5 hrs
Unit 2: Reconnaissance and Benchmark Establishment 5 hrs
Unit 3: Levelling field work (Different methods) 35 hrs

Indoor work
Unit 4: Computation and plotting of profiles 5hrs+10 hrs

TRAVERSE SURVEY

Field work
Unit 1: Instrument Checking 5 hrs
Unit 2: Reconnaissance and Monumentation 5 hrs
Unit 3: Theodolite/total station Traverse (open and closed loop) 35 hrs
Unit 4: Graphical Plotting and adjustment 5hrs+10 hrs
Cartography  
EG 2104 GE

Total:  8 hrs/week  
Lecture:  3 hrs/week  
Tutorial:  1 hrs/week  
Practical :  4 hrs/week

Year:    II  
Semester:  I

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 explain the concepts of the followings and apply them in the field of related engineering area

1. Concept of Cartography
2. Principle of Cartography
3. Different methods of map making
4. Map reproduction

Course Contents:

Unit 1  Introduction  
1.1. Definition  
1.2. Scope and uses of Cartography  

Unit 2  Map  
2.1. Definition  
2.2. Types of Map  
2.3. Uses of Map  
2.4. Map Scale  
2.5. Enlargement and Reduction of Map Scale  
2.6. Map Design and Layout  
2.7. Name Placement  
2.8. Symbol used in maps  

Unit 3. Components of of Cartography  
3.1. Map Compilation  
   • Base Map, Derived map and Special Purpose (Thematic) Map  
   • Steps of Map Compilation  
3.2. Map Reproduction  
   • Desktop Cartography  
   • Contact Photography  
   • Camera Photography  
   • Plate Making Process (Positive and Negative System)/ Digital Methods  
   • Quality Control (Colour Proof and Maintenance of Register)  
   • Map Printing
Unit 4. **Graphic Variables** [3hrs]
4.1. Definition
4.2. Importance of Graphic Variables
4.3. Types of Graphic Variables

Unit 5. **Map Projection** [7hrs]
5.1. Introduction
5.2. Classification of Map Projection
5.3. Choice of Map Projection
5.4. Universal Transverse Mercator (UTM) Projection
5.5. Projection System used in Nepal

Unit 6. **Map Sheet Numbering** [6hrs]
6.1. Introduction
6.2. Map Sheet Numbering for Topographic Maps in Nepal
6.3. Map Sheet Numbering for Cadastral Maps in Nepal

Unit 7. **Generalization** [4hrs]
7.1. Definition
7.2. Different Methods of Generalization

Unit 8. **Relief Representation** [6hrs]
8.1. Definition of Relief
8.2. Importance of Relief Representation in Maps
8.3. Methods of Relief Representation
   • Spot Height
   • Contouring
   • Hill Shading
   • Layer Tinting
   • 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

Unit 10. **Digital Cartography** [6hrs]
10.1. Introduction
10.2. Raster and Vector Data
10.3. Differences between Digital and Conventional Cartography
10.4. Introduction to Digital Landscape Model (DLM) and Digital Cartographic Model (DCM)

Unit 11. **Revision and Test/Exam** [5hrs]
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
Cartography – 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. Trace a fragment (2’ 30” X 2’ 30”) of different details of Topographic Map of Scale 1: 25000  [10 hrs]
4. Identify and List the different Visual Variables in the Topographic Map of Nepal  [2 hrs]
5. Show the Sheet Numbering System of Topographic Map of Nepal  [4 hrs]
6. Show the Sheet Numbering System of Cadastral Map of Nepal  [8 hrs]
7. Generalize the boundary of given District/VDC Polygon  [4 hrs]
8. Generate (manually) contour lines from the given spot heights  [6 hrs]
9. Prepare a Location Map of a given location  [4 hrs]
10. Prepare Colour Separation Sheets (2’ 30” X 2’ 30” Topographic Map; Four Colours) for Plate Making  [8 hrs]
Survey Drawing II  
EG 2105 GE

Year: II  
Semester: I

Total: 8 hrs/week  
Lecture: hrs/week  
Tutorial: 1 hrs/week  
Practical: 7 hrs/week

Course Description: This part of the course deals with engineering drawing and Auto CAD Applications.

Course Objectives:  
After the completion of this course, students will be able to
1. Draw simple geometrical figures,
2. Draw sketches of an area visited,
3. Interpret Simple Engineering drawing
4. Use Autocad tools for plotting of measurements.

Course Contents:

Unit 1: Projection  
3.1 Introduction  
3.2 Isometric Projection  
3.3 Orthographic Projection  

Practical:
1. Construct an Orthographic Projection of given Solid Figure  

Unit 2: Profile  
4.1 Introduction  
4.2 Definition of Cross-section and longitudinal-section  
4.3 Importance of Cross-section and Longitudinal-section in Surveying and Mapping

Practical:
1. Draw Profiles from the given data

Unit 3: Engineering Drawing  
3.1 Introduction to Engineering Drawing  
3.2 Section views and Dimensioning  
3.3 Intersections

Practical:  
1. Intersections of
   - Line and Plane
   - Plane and Plane
   - Line and solid figure
1. Plane and solid figure
2. Section views in orthographic projection datum. Dimensioning
3. Engineering drawing Interpretation

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<th>Computer Aided Design (CAD) – (Working Theory and Practical)</th>
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<td>Drawing objects - lines, polygons, circles, points and multi-lines.</td>
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<td>Object Selection- Picking, selection sets, options and settings</td>
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<td>Modifying objects - Detailed description of all modify commands</td>
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<td>Units and Scale- Drawing scales units and unit control</td>
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<td>Drawing Aids- Use of various function keys (F1 to F10)</td>
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<td>Object Properties - layers, colors and line types</td>
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<td>Text and its use in Auto CAD</td>
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<td>Project Work (Auto CAD Application)</td>
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Revision and Test  
[18hrs]

**Reference Book**

2. Engineering Drawing Volume I and II by K.R. Gopalkrishna
5. Elements of Cartography, H. Robison
Semester IV

EG2201GE  Control Surveying II
EG2202GE  Topographical Survey
EG2203GE  GIS Basics
EG2204ES  Earth Science & Environment
EG2205GE  Survey Computation and Adjustment
## Diploma in Geomatics Engineering
### Curriculum Structure - Second Year/ Second Part

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Control Surveying II
EG 2103 GE

Total: 9 hrs/week
Lecture: 2 hrs/week
Tutorial: 1 hrs/week
Practical: 6 hrs/week

Year: II
Semester: II

Course Description:
This subject deals with methods of establishing horizontal and vertical controls, Triangulation, Trilateration, Theodolite 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. Establish Triangulation network
3. Use trilateration methods for establishing horizontal controls
4. Distinguish among different technique of establishing control points.

Course Contents:
Unit 1: Triangulation 20 hrs
1.1 Introduction
• Definition
• Purpose
• Scope
• Classification of Triangulation Network
• Different Orders of Triangulation and their Specifications
• Types of Figure
• Strength of Figure
• Types of Control Points

1.2 Reconnaissance and Monumentation
• Introduction
• 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
• Care and Maintenance of Monuments

1.3 Signals used in Triangulation:
• Different Types of Signals
- Choice of Signals
- Observation Tower
- Method of erecting Signals
- Care and Maintenance of Signals

### 1.4 Field observation and recording:
- Observation of Horizontal and Zenithal/ Vertical Angles
- Distance Measurements
- Recording the observation
- Joint Observations
- Satellite stations
- Field check
- Reduced means
- Triangular Misclosure
- Satellite Stations

### 1.5 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
- Height of Station
- Types and Sources of error
- Standard and specification
- Error adjustment and Accuracy Assessment

### Unit 2: Trilateration: 5 hrs

2.1 Introduction
2.2 Definition and Principles
2.3 Purpose and Scope
2.4 Method of Trilateration
2.5 Instruments to be used
2.6 Observation Method
2.7 Field Book
2.8 Computation and Adjustment
2.9 Comparison of Triangulation and Trilateration
2.10 Advantages and Disadvantages

### Unit 3: Theodolite Resection and Intersection: 5hrs

3.1 Introduction
3.2 Definition and Principles
3.3 Purpose and scope
3.4 Method of Observation
3.5 Recording
3.6 Computation and Adjustment
3.7 Precautions to be taken
3.8 Advantages and Disadvantages

### Unit 4: Revision and Test 15 hrs
Control Survey II Practical

Field work

Unit 1: Triangulation field work 60hrs
1.2 Instrument Checking
1.3 Reconnaissance and Monumentation
1.4 Field procedure

Unit 2: Trilateration 15hrs

Unit 3: Intersection and Resection 15hrs

Reference Books:
1. Surveying (Volume 1, 2 and 3) by Dr. K.R. Arora: Rajons Publication Pvt. Ltd.
2. Surveying (Volume 1, 2 and 3) by Dr. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain: Laxmi Publication (P) Ltd.
3. Surveying Vol I and II, S.K DUGGAL
4. जमीन सर्वेक्षण, तीर्थ चलानार प्रधानाङ
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 [5 hrs]
1.1. Introduce Topographical Surveying and define the following:
   - Planimetric and altimetric detail
   - Artificial and natural features
1.2. Methods of Topographical Surveying: Brief Introduction
   - Ground Survey Method
   - Photogrammetric survey Methods

Unit 2: 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 Alidade
   - Plumb bob
   - 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 problem
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 3: Numerical Surveying [10 hrs]

3.1 Introduce Numerical Surveying
3.2 Explain Principle of Numerical Survey
3.3 Explain the Methods
3.4 Identify the Uses
3.5 Describe in short the following Instruments and accessories used for Numerical survey:
   • Tape,
   • Theodolite,
   • EDM,
   • Total Station and
   • GPS

Unit 4: Operations of Numerical Survey [15 hrs]

4.1 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

Unit 5: Define Contour survey [5 hrs]

5.1 Define contour line and contour interval
5.2 Describe Characteristics of contour
5.3 Explain the Methods of Contouring

Revision and Test: [10 hrs]

Reference Books

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
TOPOGRAPHICAL SURVEYING PRACTICAL

Unit 1: Establishment of Controls for Plane Table  [10 hrs]
Unit 2: Plane Table Traverse Survey and adjustment  [10 hrs]
Unit 3: Large Scale Topographical Mapping by Plane Table Survey in the scale of 1:1000 / 1:500  [15 hrs]
Unit 4: Map Compilation  [05 hrs]
Unit 5: Planning for Numerical Surveying  [10 hrs]
   5.1 Preparation for field work and arrangement of necessary equipment
   5.2 Organization of field data
   5.3 Calculation and adjustment
   5.4 Plotting and drawing
   5.5 Exercise for calculation of area based on numerical data
Unit 6: Carry out following steps of Numerical Survey in the Field  [35 hrs]
   6.1 Reconnaissance
   6.2 Observation/Data Capture for Topographical/Cadastral/Engineering Mapping (1:500)
Unit 7: Revision and Test  [05 hrs]
Geographic Information System (GIS) Basics
EG2203GE

Total: 8 hrs/week
Year: II
Semester: II
Lecture: 3 hrs/week
Tutorial: 1 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. The course focuses on practical approach in learning database and GIS concepts.

Course Objectives:
After the completion of this course, students will be able to:
1. understand database management system and design simple databases
2. understand the basic concept of GIS and its applications in various fields
3. operate GIS software for simple applications
4. perform simple GIS operation and preparing data for GIS applications
5. query the databases
6. compose maps

Course Contents:
Unit 1: Database Management System [10 hrs]

1.1 Introduction to Database Management System
- Define term Data and information
- Define Databases and databases management system (DBMS)
- Explain the component of database management system
- Define: tables, form, Query, relationship, reports

1.2 Logical Data concept and Relationships
- Introduce logical data concept: entities, data value, field/attribute, records and relationships
- Explain the types of relationships (one to one, one to many, many to many)
- Define database tables and explain field data types
- Explain key field (primary key, candidate key and foreign key)

1.3 Data models and DBMS applications
- Introduce different types of Relational Data Model
- Define object oriented data model
- Introduce database language: Data definition language (DDL), Data Manipulation Language (DML)
- Introduce physical and conceptual data models
- Introduce database modeling process
- Explain the process of creating a database tables
- Query relational databases
• Explain database administration
• Explain the need and applications of Database Management System (DBMS)

Unit: 2 GIS and Spatial Data Models [10 hrs]

2.1. Introductions to GIS

• Define GIS
• Introduce Component of GIS
• Introduce different stages of GIS workflow (Data Acquisition, Data storage & Management, Data Analysis, and Visualization)
• Define the terms: spatial and non-spatial data, features, attribute tables.
• Explain GIS applications & Users

2.2. Spatial Data Models

• Vector Data Model
  - Define Vector Data Models
  - Define Scale
  - Make familiar with file format of vector data
  - Introduce Geometry types of vector data (point, Line & Polygon)
  - Explain the applications of vector data models
  - Understand advantages and disadvantages of the use of Vector data model

• Raster data Model
  - Define Raster Data Models
  - Define resolution of raster dataset
  - Make familiar with file format of Raster data
  - Introduce the raster data structure (Grid Cells)
  - Explain the applications of vector data models
  - Understand advantages and disadvantages of the use of Vector data model

• TIN Data Models
  - Define TIN data models
  - Data Structure of TIN model
  - Explain the applications of TIN data model

Unit: 3 Spatial Data Acquisition and Preparation [10 hrs]

3.1 Sources of Spatial Data

a. Primary Data Sources
  - Ground surveying, GPS and DGPS
  - Photogrammetry
  - Remote sensing

b. Secondary Data Sources
  - Existing paper maps
  - Clearinghouse and online sources

3.2 Data Entry and Data Preparation

• Define map scanning process & Scanning Resolution
• Define Geo-referencing and map projection
• Introduce digitization process
• Define attribute information
• Create attribute data of digitized features
• Checking and repairing Geometry of spatial data
• Define topology
• Understanding the topological rules and the process for generating topology

Unit 4  GIS Operations and Map composition  [10 hrs]

4.1 Querying Databases
• Define querying database
• Understand structure of query language (SQL)
• Define and explain The terms: attribute query, Spatial 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 Map composition
• Define maps as output of GIS
• Explain steps of map composition in GIS environment
• Understand Map lay out and map elements
• Understanding use of color and symbols in maps

Unit 5:  Test and Revision  [20 hours]
Geographic Information System (GIS) Basics

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
   - Introduce GIS software used
   - Add data Layers
   - 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)
   - Import external point data into GIS environment
2.2 Geo-referencing & Map Projection
   - Geo-reference scanned maps/ images
   - Define and Setting out map projection (Nepalese map projection system)
   - Transform maps in different coordinate system

Unit 3: Creating data layers and table operation [10 hrs]
3.1 Working with arc-Catalogue
   - Explore data in Arc-Catalogue
   - View meta data and data information in arc catalogue
   - Create Vector layers (point, line polygon)
3.2 Table Operations
   - view Table statistics
   - 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
• Add Attribute information

Unit: 4  **Query and Overlay Operation**  [10 hrs]

4.1 Querying Databases
• Perform Attribute query
• Select by location (spatial query)

4.2 Overlay Operation
• Perform following Overlay operation
  - Clip
  - Intersection
  - Union
  - Merge
  - Generate Buffer

Unit: 5  **Visualization**  [10 hrs]

5.1 Map composition and map printing
• Compose map
• Export maps indifferent formats
• Print maps

**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)
# Earth Science and Environment

**EG2204ES**

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<tr>
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<tbody>
<tr>
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**Course Description:**
The Earth Science and Environment curriculum focuses on the function of Earth’s systems. Emphasis is placed on Environmental process, Environmental changes and Environmental awareness. Further, course target on use of GIS technology for acquiring and presenting spatial data.

**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. Understand basic concept of Environment process and changes.
2. Acquire and present Spatial Data
3. Investigate and analyze the importance of Environmental Project

**Course Content:**

### Unit 1: Introduction to Environment  
2hrs

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<thead>
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<tr>
<td>1.1</td>
<td>Elements of Environment</td>
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<td>1.2</td>
<td>Define Natural Environment</td>
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<td>1.3</td>
<td>Define The Man Made Environment</td>
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<td>1.4</td>
<td>Scope of Environment</td>
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<td>Importance of Environment</td>
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### Unit 2: Resources of the Earth  
8hrs

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<tr>
<td>2.1</td>
<td>Introduction to the major resources of the Earth,</td>
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<td>2.2</td>
<td>Define type of rocks and rock formulation process</td>
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<tr>
<td>2.3</td>
<td>List out mineral resources</td>
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<tr>
<td>2.4</td>
<td>Explain water type and source of water resources.</td>
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<tr>
<td>2.5</td>
<td>Define soil and soil formation process</td>
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<td>2.6</td>
<td>List out composition of air</td>
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### Unit 3: Ecology and Ecosystem  
3hrs

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<tbody>
<tr>
<td>3.1</td>
<td>Define Ecology and Ecosystem</td>
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<tr>
<td>3.2</td>
<td>List Physical Environmental and Biotic Factor</td>
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<tr>
<td>3.3</td>
<td>Define Types of Ecosystem</td>
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<td>3.4</td>
<td>Define Terrestrial Ecosystem: Grassland Ecosystem, Forest Ecosystem</td>
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<tr>
<td>3.5</td>
<td>Define Aquatic Ecosystem: Pond Ecosystem, Wetlands Ecosystem</td>
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<td>3.6</td>
<td>Define Food Web: Role of Food Web in Ecosystem</td>
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### Unit 4: Pollution  
1hrs

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<td>4.2</td>
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<td>List Types - Air, Water, Land</td>
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### Unit 5: Air Pollution  
2hrs

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<td>5.3</td>
<td>Effects of Air Pollution</td>
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</table>
5.4 Health Hazards
5.5 Air Pollution control Measure

Unit 6: Water Pollution 2hrs
6.1 Types of water pollutants
6.2 Sources of Water Pollution
6.3 Effects of Water Pollution
6.4 Health Hazards
6.5 Water Pollution Control Measures

Unit 7: Land Pollution 2hrs
7.1 Types of Land Pollutants
7.2 Sources of Land Pollution
7.3 Effects of Land Pollution
7.4 Health Hazards
7.5 Land Pollution Control Measures

Unit 8: Natural Disasters 4hrs
8.1 Landslides: Causes of Landslides, Impact on Life and Economy, Control Measures
8.2 Floods: Causes of Floods, Impact on Life and Economy, Control Measures
8.3 Earthquake: Causes of Earthquake, Impact on Life and Economy,
8.4 Precautionary Measures
8.5 Drought: Causes of Drought, Impact on Life and Economy, Control Measures

Unit 9: Land Resource Mapping 3hrs
9.1 Introduction to Land Resource Mapping in Nepal
9.2 Define Sustainable Development (Agenda 21)

Unit 10: Environment Assessment 4hrs
10.1 Definitions and general principal of environmental assessment
10.2 Types of Environmental Assessments
10.3 (Environmental Impact Assessment, Environmental Impact Statement, Strategic Environment Assessment)

Unit 11: Environment Laws 4hrs
11.1 Define Environmental Law
11.2 Domestic Environmental Law – Examples of Domestic Environmental Law
11.3 International Environmental Law – Foundations of Environmental Law, Making International Laws (Treaties and Customary Law), Milestones in International Environmental Law

Unit 12: Elementary Geology 3hrs
12.1 Soil Types
12.2 Rock Types
12.3 Geological Mapping

Unit 13: Revision and Test 7hrs

References
1. Ecology Principle and application/J. L. Chapman, M. J. Reiss
2. Environment and Biodiversity/Edited by P. K. Jha ...[at el]
4. *Environmental Pollution and Management* /I. Mohan
5. *EIA Training Manual for Professionals and Managers* /IUCN, Nepal
11. [http://www.ace.mmu.ac.uk/eae/sustainability/older/Local_Agenda21.html](http://www.ace.mmu.ac.uk/eae/sustainability/older/Local_Agenda21.html)
Earth Science and Environment – *Practical*

**Unit 1:** Acquire and Update Spatial data of an area (5+15) hrs

1.1 Fieldwork carried out under the direction or supervision of an instructor in the Program. Methods and principles of Environmental field work, sampling and sample location. Display and query spatial data and produce map products.

**Unit 2:** Prepare a given environmental study report (5+20) hrs

2.1 Student prepares report in any of the theme related to environment and carry out field work under the direction or supervision of an instructor in the Program. Final report should be prepared following standards and presented in class. Report will be assessed based on report format, discussion on environmental issues and data presentation.
Survey Computation and Adjustment  
EG 2205GE

Year: II  
Semester: II  
Total: 7 hrs/week  
Lecture: 2 hrs/week  
Tutorial: 1 hrs/week  
Practical: 4 hrs/week  

Course Description:
This course deals with the computation and adjustments of field survey data related to control surveying.

Course Objectives:
After the completion of this course, students will be able to
1. Understand the principles of measurement errors
2. Understand the methods of computation used for surveying controls
3. carryout
   - Traverse surveying computation
   - Triangulation computation
   - Trilateration computation
   - Intersection and Reection computation
4. Understand and apply the techniques of adjustment commonly used in engineering surveying

Course Contents:
Unit 1. Theory of measurement errors and adjustments 20hrs

1.1 Introduction  
   - Basic Concept of errors  
   - Classification of errors  
   - Theory of errors  
   - Methods of adjustment  
   - Probability, Weight of the measurement
1.2 Error Analysis  
   - Arithmetic mean,  
   - Standard deviation, Probable error  
   - Law of normal distribution of random error  
   - Limit error and tolerance in the measurement, RMS error of functions of measured quantities
1.3 Error Adjustment  
   - Concept of Least Square and methods of adjustment with least square

Unit 2  Traverse Computation 5hrs
2.1 Computation of Bearings of the traverse legs with initial bearing and measured angles
2.2 Computation of Bearing and distance from coordinates
2.3 Open Traverse computation
2.4 Computation of closed traverse on known points
2.5 Computation of closed traverse loop
2.6 Closing error, Permissible error
2.7 Distribution of error, correction

Unit 3  Triangulation Computation  5hrs
1.1 Simple chain of triangles and triangle misclosures
1.2 Spherical excess
1.3 Coordinate computation of simple chain of triangle
1.4 Error Adjustment of a Braced quadrilateral
1.5 Angle Condition and Side Condition equations
1.6 Error Adjustment in a central polygon
1.7 Coordinate computation of a central polygon

Unit 4.  Intersection and Resection  3hrs
4.1 Intersection computation
4.2 Resection Computation

Unit 5:  Trilateration Computation  2hrs
5.1 Slope -horizontal conversions
5.2 Solution of triangles and adjustment
5.3 Coordinate computation

Unit 5:  Test and Revision  10hrs

References

1. Surveying Volume I and II, Dr. Punmia, Laxmi Publications (P). Ltd, New Delhi, India
3. Fundamental of Surveying, S.K Roy, Prentice –Hall of India, New Delhi
4. Practical Field Surveying & Computations, A.L ALLAN, J.R. HOLLEY
5. Theory of errors & Adjustment, M.G Arur
Survey Computation and Adjustment - Practical

**Indoor**

**Unit 1. Traverse Computation and adjustment**  
10hrs+12hrs

1.1 Computation of Bearing and Distance from coordinates
1.2 Computation of Bearing from angles
1.3 Computation of coordinates
1.4 Error adjustment and computation of closed traverse

**Unit 2. Triangulation Computation**  
10hrs+12hrs

2.1 Compilation of angular observation data
2.2 Computation of triangle misclosures
2.3 Computation of spherical excess
2.4 Strength of figure
2.5 Error adjustment and coordinate computation in a braced quadrilateral
2.6 Error adjustment and coordinate computation in a central polygon

**Unit 3. Intersection and Resection**  
4hrs+4hrs

3.1 Computation of Coordinates from the Intersection
3.2 Computation of Coordinates from Resection observations

**Unit 4. Trilateration Computation**  
4hrs+4hrs

4.1 Slope -horizontal conversions
4.2 Solution of triangles and adjustment
4.3 Coordinate computation
Third Year
(Semester V & VI)
Semester-V

EG3101GE  Cadastral Surveying
EG3102GE  Photogrammetry
EG3103GE  Remote Sensing
EG3104SH  Entrepreneurship & Community Skill
EG3105GE  Elementary Geodesy, Astronomy And GPS
### Diploma in Geomatics Engineering

#### Curriculum Structure- Third Year/ First Part

**Year: III**

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**Total Marks: 750**
Cadastral Surveying
EG3101GE

Year: III  
Semester: I

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.  Fundamentals of Cadastral Surveying  [20 hrs]

1.1. Introduction
• Definitions: Cadastral Surveying, Adjudication, Cadastre, Parcel, Boundary, and other relevant terms
• Importance of cadastral surveying for land administration and management
• History of Nepalese Cadastral Surveying

1.2. Cadastral maps
• Principles of cadastral mapping in Nepal Map scale, Units (Revision)
• Control Points for Cadastral Surveying and preparation of cadastral sheets
• Concept of Plotting Error
• Parcel numbering or unique parcel ID
• Specifications and Standards

Unit 2. Cadastral Data Acquisition  [15 hrs]

2.1 Plane Tabling Technique of data acquisition
• Plane Table and Accessories
• Data acquisition process
- Field Book Preparation
- Inking and tracing of cadastral maps
- Area Computation and checking
- Quality management: Field Supervision

2.2 Concept of Digital Cadastre
- Equipment (Total Station), tools and accessories for data acquisition
- Preparation for data acquisition
- Data Recording for parcel boundary
- Field Book Preparation
- Data download

2.3 Parcel delineation from Orthophoto

**Unit 3. Cadastral Surveying in Nepal** [10 Hrs]

3.1 Organizational Structure

3.2 Cadastral Surveying Process: Systematic Adjudication process
- Notification
- Densification of Control Points
- Adjudication
- Surveying and Mapping (Data Acquisition, Unit 2)
- Land Classification
- Area Computation
- Document Preparation
- Registration of Ownership
- Settlement of Civil Cases and Disputes
- Data Management
- Handing Over of cadastral data

3.3 Adjudication: (Sporadic and Systematic), Sporadic Adjuration and maintenance of survey records

**Unit 4. Modern Cadastre: example of developed cadastre** [5 Hrs]

4.1 General Introduction to Modern Cadastre

4.2 Examples of Modern Cadastre

**Revision and Test** [10 Hrs]
**Reference Books**

1. *Cadastral Survey within the commonwealth P.F Dele, MA ARICS (1976)*
2. *Land Registration and Cadastral System, Gerhard Hursson*
3. *Surveying Vol I and II, S.K DUGGAL*
4. *Plane Surveying, David Clark*

Hindi:

1. किसा नापी निर्देशिका, नापी विभाग
2. नापी शाखा एवं नापी गौर्ज़राण कार्यविधि, नापी विभाग
3. किसान गोदान, वेखानाल क्षेत्र
e. भूमिमतल्ल परिसंचरण एवं किसा नापी, वेखानाल क्षेत्र
Cadastral Surveying Practical

Unit 1. Indoor Exercise [15hrs+15 hrs]

1.1 Organisation of Field Data
1.2 Inking and Tracing Exercise of Graphical Cadastral Map
1.3 Area Computation in Analogue Environment
   • Using tiles and computing scale
   • Using triangle formula
   • Using coordinates
1.4 Documentation of cadastral activities: field book, notice, land registration records, land registration certificates, etc
1.5 Parcel subdivision
1.6 Demonstration of Digital Cadastral mapping
   • Data Download
   • Plotting
   • Area Calculation
   • Creating parcel ID
   • Labeling features
   • Visualization

Unit 2 Outdoor Exercise [90 hrs]

2.1 Cadastral data acquisition on the scale of 1:500 using Plane Table (Step by step approach to be followed by Nepalese cadastral surveying)
2.2 Numerical cadastral survey of selected land parcels using theodolite
2.3 Parcel Identification and Boundary demarcation or layout
Photogrammetry
EG 3102GE

Year: III
Semester: V

Total: 7 hour/week
Lecture: 3 hours/week
Tutorial: 1 hour/week
Practical: 3 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 explain the concepts of the followings and apply them in the field of related engineering area:
1. Terminologies of Photogrammetry
2. Aerial camera and scale of the photograph
3. Stereoscopic vision techniques
4. Different photogrammetric equipment
5. Techniques of aerial triangulation
6. To recognize the features in the aerial photograph
7. Method of photo mosaic and its use
8. Procedure of mapping by photogrammetric method

Course Contents:

Unit 1. Introduction [8 hrs]

1.1. Define Photogrammetry
1.2. Explain briefly the History of Photogrammetry
1.3. Define Projection and list out the properties of Orthogonal and Perspective Projections
1.4. Define the following Terminologies:
   - Fiducial Marks
   - Fiducial Axis
   - Nadir Point
   - Principal Point
   - Perspective Centre
   - Focal Length
   - Principal Distance
   - Camera axis
   - Principal Axis
   - Principal Plane
1.5. Explain the Components of Photogrammetry
1.6. Explain the scope of Photogrammetry in Survey Profession
1.7. Compare Aerial Photograph and Map

Unit 2. Aerial Photography [9 hrs]
2.1. Explain basic concepts and types of aerial camera
2.2. Define Essential parts of an aerial camera
2.3. Define the following Types of lens
   - Narrow Angle,
   - Normal Angle
   - Wide Angle
   - Super Wide Angle
2.4. Define and familiarize with the application of:
   - Vertical
   - Oblique: Low oblique and high oblique
2.5. Explain Aerial Photographic process
2.6. Derive the formula for Scale of Vertical Aerial Photograph
2.7. Determine Scale of a Photograph
2.8. Define Relief Displacement and derive formula to find out the value of relief displacement
2.9. Define Tilt Displacement
2.10. Define familiarize with the need of:
      - Overlap : Forward and Lateral
      - Drift and Crab

Unit 3. Stereoscopy [9 hrs]
3.1. Define Stereoscopic Vision and list out conditions for seeing stereoscopic vision
3.2. Define Parallax and derive Parallax Equation
3.3. List out the process for Orientation of Pair of Photographs
3.4. Explain the methods for Stereoscopic Viewing using the following techniques
      - Pocket and Mirror Stereoscope
      - Anaglyph System
      - Modern Methods
3.5. Identify the Orientation Elements of a photograph and show their motion
3.6. Explain Stereo restitution
3.7. Define the following:
   • Inner orientation
   • Exterior orientation: Relative and Absolute orientation
   • Point transfer and Image matching
   • Rectification

Unit 4. Introduction to Photogrammetric Instruments [8 hrs]
   • Stereo Plotters
     - Optical Projection Plotter
     - Mechanical Projection Plotter
     - Analytical Plotters
   • Digital Photogrammetric workstation

Unit 5. Aerial Triangulation [8 hrs]
   5.1. Define Aerial Triangulation
   5.2. Explain its Purpose
   5.3. Describe Principle of Aerial Triangulation
   5.4. Describe methods of Aerial Triangulation

Unit 6. Photo Interpretation [3 hrs]
   6.1. Define Photo Interpretation
   6.2. Explain the Basic Characteristics of Photographic images
   6.3. Describe photo interpretation elements

Unit 7. Photogrammetric Procedure [6 hrs]
   8.1. Explain Elements of Photogrammetric mapping
   8.2. Define and describe briefly the process of Generating Digital Elevation Model (DEM)
   8.3. Define Ortho Rectification and describe briefly the process of orthophoto production
   8.4. Differentiate aerial and orthophoto
   8.5. Orthophoto Mosaic
   8.6. Feature extraction

Revision and Test [6 hrs]

Reference Books
1. Elements of Photogrammetry, by Paull R. Wolf, MCGRAW HILL  INTERNATIONAL EDITION
2. Interpretation of Aerial Photographs, T.Eugene Avery
3. Remote Sensing Principal And Image Interpretation, Thomas M. Lillesand, Ralph W. Kiefer
PHOTOGRAMMETRY PRACTICAL

Unit 1: Introduction [8hrs+8 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 [5hrs+5 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 [10hrs+10 hrs]
3.1 Measure Forward and Lateral Overlap of the photographs
3.2 Select and mark Minor Control Points in a block of Aerial Photographs
3.3 Prepare Photo Index
3.4 Prepare a Photo Mosaic
3.5 Identify Selected Features on Aerial Photograph

Unit 4: Exercise on Digital Photogrammetry (12hrs+12hrs)
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
Remote Sensing
EG3103GE

Year: III  
Semester: I

Total: 5 hour/week  
Theory: 2 hours/week  
Lecture: 1 hour/week  
Practical: 2 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:
1. Understand the basic concepts of remote sensing principles
2. Explore and interpretation the satellite images
3. Perform the simple operation with remotely sensed data
4. Conceptualize the application of Remote sensing data

Unit 1: Introduction to Remote Sensing (10 hrs)
1.1 Definition
1.2 Components of Remote Sensing
1.3 Energy & Sensor
1.4 Interacting Body - Active and Passive Remote Sensing
1.5 Sensor Platforms (Balloons, Helicopters, Aircraft and Satellites)
1.6 Electro Magnetic Radiation (EMR),
1.7 EMR spectrum: Visible, Near IR, Middle IR, Thermal IR and Microwave

Unit 2: EMR interaction with Atmosphere and Earth Materials (12 hrs)
- Atmospheric characteristics
- Scattering of EMR
- Raleigh, Mie Scattering
- EMR Interaction with Water vapor and ozone
- Atmospheric Windows
- Significance of Atmospheric windows
- EMR interaction with Earth Surface Materials
- Radiance, Irradiance, Incident, Reflectance,
- Absorbed and Transmitted Energy Reflectance
- Specular and Diffuse Reflection Surfaces- Spectral Signature
- Spectral Signature curves
- EMR interaction with water, soil and Earth Surface
Unit 3: Image Interpretation, Enhancement and Classification  8hrs

- Familiarizing with different types of images: Panchromatic Multi-spectral, Hyperspectral
- Visual Interpretation of Satellite Images
- Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image
- Image enhancement
- Filtering
- Classification – Supervised classification and unsupervised classification
- Signature collection and merging signatures
- Image mosaic

Test and Revision  15hrs
Remote Sensing Practical

Lab Exercise (30 Hrs)

1. Observation of image and reading pixel data
2. Observe image bands of multi spectral images
3. Stacking layers and prepare multi spectral images
4. Geo-reference satellite image
5. Classify Satellite Images
6. Mosaic images Image
7. Enhance Image

Text Books


Reference

Entrepreneurship & Community Skill
(EG3104SH)

Year: III  
Semester: VI  
Total: 6 Hours/week  
Theory: 2 Hours/week  
Tutorial: 1 Hours/week  
Practical: 3 Hours/week

Course Description:
The course focuses on the basic concepts community skill and Entrepreneurship. This also includes the concept of planning a small scale business.

Course Objective:
At the end of the course, student will be able to:
1. explain basic concept and uses of community.
2. define basic concepts and skills of community knowledge and Management of business.
3. explain basic concepts of entrepreneurial skills in making Business of their profession.

Course Content

Unit 1  Introduction to community. 3hrs
1.1. Define community (with its types, characteristics and functions)
1.2. Roles of members of community in development.
1.3. Define human nature (Needs, Interests, Emotion)
1.4. Define motivation
1.5. Maslow’s ladder of human needs.
1.6. Importance of community skills for surveyors.

Unit 2  Community development 2hrs
2.1 Define development
2.2 Concept of sustainable development, Human development and community Development.
2.3 Explain different development Approaches (Concept of community Participant, Empowerment, mobilization, PRA, APA)
2.4 Define development Agencies.

Unit 3  Resources of community
3.1 Community Members
3.2 Institutions and knowledge
3.3 Technology
3.4 Natural Resources
3.5 Relationship

Unit 4  Community Resource Mobilization 2hrs
4.1 Assessment of resource in use
4.2 Institutions/local organizations and their mobilization
4.3 Exploration of new resources for effective management: - local products, Technologies, Institutions

Unit 5  Building awareness, co-ordination and organization 2hrs
5.1 Stage of Project life cycle
5.2 Define co-ordination
5.3 Networking with public, CBos, NGos, and INGos
5.4 Define organization
5.5 Organization formulation

Unit 6  Form user group and conduct its meeting 5hrs
6.1 Define and conduct user group
6.2 Definition and allocation of roles
6.3 Role of catalyst
6.4 Purpose of user group
6.5 Introduction to Agenda setting
6.6 Meeting organization and discussions
6.7 Digging deeply in discuss
6.8 Root causes of problem

Unit 7  Conduct training 3hrs
7.1 Define training and its need
7.2 Brain storming (need, rules of doing Brainstorming)
7.3 Importance of local knowledge for training
7.4 Basic Idea of 4 ‘C’ Approach
7.5 Define Presentation
7.6 Adult learning principle
7.7 Learning tools

Unit 8  Entrepreneurship and Entrepreneur 4hrs
8.1 Define Entrepreneurship and Entrepreneur
8.2 Sources of business Information
8.3 Prioritization of goals
8.4 Problem solving procedures
8.5 Risk calculation methods

Unit 9  Business in operation 3hrs
9.1 Define Business
9.2 Sources of Idea generation for Business
9.3 Forms of Business organization
9.4 Identification of Funding Resources promoters, Banks
9.5 Explain SWOT Analysis

Unit 10 Management and Planning of Business 5hrs
10.1 Meaning, concepts and Definition of Business
10.2 Explain managerial functions (planning, organizing, coordination and Controlling)
10.3 Sources of Management Assistance
10.4 Introduction to business plan and its component
10.5 Rules and regulations of government for establishing small business.
10.6 Planning in Small business
10.7 Sources of machinery and raw materials
10.8 Calculation of pro- project expenses, cost price, sale price, BEP, ROI, market Share, production level and depreciation.

Unit 11 Human Resource Management 2hrs
11.1 Define Human Resources
11.2 Team Building
11.3 Leadership skill
11.4 Recruitment and Selection
11.5 Placement of Human Resource
11.6 Concept of Human Resource development
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<th>Determine marketing</th>
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<td>Define market and marketing</td>
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<td>Introduction to 4ps (Basic idea about product, price, place and problem)</td>
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<td>13.3</td>
<td>Introduction to product life cycle</td>
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<td>15.1</td>
<td>Define Communication</td>
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<td>List the types of Communication</td>
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<td>Means of Communication</td>
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</table>

**Revision and Test** 10hrs

**Reference Books**

1. *Introduction to Marketing – Dr. Fatta Bahadur K.C*
2. *Entrepreneurship Development by Devendra Manandhar (CTEVT)*
3. *Effective Performance in Project Management, Jan Wisen and orje Lindblom*
4. *Community Development Reports published by different NGOs and INGOs*
5. *Samudayik Bikas, Nepali Sandhrave by Krishna Bahadur K.C, Published by: Society for community development Professionals, 1990*
Entrepreneurship & Community Skill Practical

A. Community Study – Report Writing 10 hrs+10 hrs

Students are required to prepare a study report individually of a given Community. The study will be based on any of the following theme of the community

6. Theme of Study of a community
   - Education
   - Social problem (girl trafficking, corruption, Drug peddling, terrorism etc)
   - Economic activities
   - Family Size and Structure
   - Developments Infrastructure and Nature Resources census
   - Gender and Domestic conflict

7. Guidelines for preparing study report

Outline of the report

a. Background of the study
b. Study Area (description & Maps)
c. Objectives
d. Methodology
e. Data Analysis and Result
f. Limitation of the study
g. Conclusion and Recommendation
h. Acknowledgement
i. Annex

B. Prepare Business Plan of a company (10hrs+ 10 hrs)

Guidelines

1. Steps to be followed for preparing Business Plan
   - Releasing the need for planning
   - Setting objectives
   - Identification and Evaluation of Alternative courses.
   - Site Selection
   - Demand and supply Analysis
   - Market Analysis
   - SWOT Analysis
   - Market Analysis
   - Collection of Budget
   - Allocation of Budget
   - Collection of raw materials
   - Promoters Activities
   - Implementation
   - Evaluation
Elementary Geodesy, Astronomy and GPS

EG 3105GE

Year: II
Semester: II

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

- Understand 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 4hrs
  2.1 Geographical Coordinates
  2.2 Rectangular Coordinates
  2.3 Concept of coordinate conversion: Geographical to rectangular

B. Astronomy

Unit 3. Introduction 3hrs
  1.8 Solar System
  1.9 Kepler’s Laws of Planetary motion

Unit 4. Celestial Sphere 8hrs
  1.8 Definitions
  1.9 Spherical triangle spherical excess
  1.10 Application of sine and cosine formulae of spherical trigonometry
  1.11 System of celestial coordinates
  • Altitude and Azimuth
• Right Ascension and Declination
  1.12 Astronomical Triangle

Unit 5. Time 8hrs
  5.1 Solar Time
  5.2 Siderial Time, Mean Solar Time and Apparent Time
  5.3 Conversion to mean Solar Time to Siderial time and Vice versa.
  5.4 Greenwich Mean Time, Universal time
  5.5 Local Time, Standard Time
  5.6 Star Almanac

Unit 6. Astronomical Observations 4hrs
  6.1 Determination of Azimuth by Sun observation.
  6.2 Determination of Latitude, Longitude and Azimuth by star observation,

Unit 7. Global Positioning system (GPS) 5hrs
  7.1 Introduction to GPS
  7.2 GPS Segments
  7.3 GPS orbital parameters
  7.4 WGS- 84
  7.5 Principle of GPS Positioning
  7.6 Absolute and relative Positioning
  7.7 Static and kinematic modes in GPS Survey
  7.8 GPS geometry and Accuracy
  7.9 Satellite system: GNSS and GLONASS

Unit 8. GPS Post Processing Concept 2hrs
  3.2 Software, Rinex Conversion
  3.3 WGS -84 Coordinates

Test and Revision 7hrs

Reference Books

1. Surveying Volume III, Dr. B.C Punmia, A.K Jain, Laxmi Publication Pvt. Ltd. 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.
Elementary Geodesy, Astronomy and GPS- Practical

Unit 1. Astronomy (5hrs+10hrs)

1.1 Sun Observation
- Observe Sun for Azimuth determination
- Compute observed data for Azimuth determination

1.2 Polar Observation
- Observe star for Azimuth determination
- Compute observed data for Azimuth determination

Unit 2. Global Positioning System (GPS) (10hrs+10hrs)

2.1 Hand held GPS
- Operate GPS device
- Capture Position Data
- Navigate Position
- Tracking Routes
- Plotting GPS data (Demonstration)

2.2 Geodetic GPS 10hrs
- Static Positioning (Demonstration)
- Differential Positioning (Demonstration)
- Post Processing (Demonstration)
Semester -VI

EG3201GE  Survey Management
EG3202GE  Land Administration and Land Laws
EG3203SE  Civil Construction
EG3204SE  Quantity Surveying
EG3205GE  GIS Applications
EG3206GE  Engineering Survey
EG3207GE  Project Work
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Diploma in Geomatics Engineering
Curriculum Structure- Third Year/ Second Part
Survey Management
EG3201GE

Total: 3 hour/week
Year: III
Lecture: 2 hours/week
Semester: II
Tutorial: 1 hour/week
Practical: 0 hour/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

- Formulate a surveying and mapping project proposal
- Planning of a minor surveying and mapping projects
- Identify needs for surveying and mapping projects
- Understand the terms of reference and specifications of a particular project
- Estimate the cost of minor surveying and mapping projects
- Reporting minor surveying and mapping projects

Course Content:
Unit 1: Introduction 4 hrs

1.1 Concept and definition: Management, Project, Project Management, etc
1.2 Types of surveying: based on purpose, methods, and use
1.3 Major Tasks of Surveying and Mapping Project

Unit 2: Essential Components of Survey Management 10 hrs

2.1 Terms of Reference, Technical Standards and Specifications
2.2 Project Planning
2.3 Resource Management: Human Resources (Task Identification and Distribution), Financial Resources, Tools, Equipments and Accessories
2.4 Costing: Concept of Activity Based Costing (ABC Costing)
2.5 Survey Project Implementation
2.6 Quality Management: Task Supervision, Instrument Adjustments
2.7 Output Management

Unit 3: Public Relation and Professional Ethics  5 hrs

3.1 Public Relation, Inter-organizational Coordination
3.2 Ethics and Code of Conduct of Surveyors
3.3 Concept of Legal provision and government policy governing a particular Survey Project
3.4 Survey Licensing

Unit 4: Proposal and Report Writing Skill  12 hrs

4.1 Language Proficiency in Writing - English/Nepali
4.2 Writing Technical Proposal: Structure and Contents
4.3 Writing Financial Proposal: Structure and Contents
4.4 Report Writing: Structure and Contents
4.5 Presentation Skill

Unit 5 Safety Management  10hrs

5.1 Care and safety of instrument
5.2 Rescue measures
5.3 Insurance
5.4 Personal safety
5.5 First aid

- Preserving life
- Prevent further injury
- Promoting recovery

5.5.1 Conditions that often require first aid
- Altitude sickness, swelling of brain or lungs
- Allergens, such as insect bites
- Bone fractures
- Burns
- Choking
- 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

5.5.2 Equipments: First aid kits (Components, list, contents)

Test and Revision 4hrs

Reference Books
1. Cadastral Survey within the commonwealth P.F Dele, MA ARICS (1976)
2. Effective Performance in Project Management, Jan Wisen and orje Lindblom
3. Project proposals and reports from different organizations
Land Administration and Land Laws
EG3202GE

Year: III
Semester: II

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.

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: Land Administration

1.1 Introduction 2 hrs

- 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

1.2 Land Tenure and Rights 4 hrs

- Land tenure: Definition and concept, History of land tenure, Land tenure system in Nepal; (Freehold, Leasehold, Guthi)
- Land right: concept, different types of right on property: use right, access right
- Security of land tenure and its importance

1.3 Land Registration System 3 hrs

- Concepts and definitions
- Concept of first registration
• Different Land Registration Systems: Conveyancing, Deeds, Title
• Land registration system in Nepal: Historical Background, Existing Registration System, Processes

1.4 **Land and property transfer process** 3 hrs
• Different types of land transactions (Rajinama, Anshabanda, Bakaspatra etc) and their process:
  • Whole parcel transaction,
  • Parcel subdivision,
  • Individual/ multiple / institutional ownership

1.5 **Land conflicts and their resolutions** 3 hrs
• Types of boundaries
• Land disputes Related to parcel boundary , Land Area and Ownership
• Land Tenureships
• Mediation and its role in land dispute settlement

1.6 **Land Management** 4 hrs
• Concept, meaning and definition of land management
• Land Use: Concepts and determinants, land use planning, land use zones, Importance of land use zoning
• Land ownership: Right, Restriction and Responsibility

1.7 **Land Valuation** 4 hrs
• Land Value
• Land Valuation Parameters
• Land Valuation techniques
• Land Market
• Land Taxation

1.8 **Land Information System in Nepal** 4 hrs
• LIS: concept and definition
• Components of LIS
• Data Sources
• Processing, Storage , Maintenance and dissemination
• Importance of LIS
• LIS development in Nepal: challenges

1.9 **Institutions related to Surveying mapping and Land Administration** 3 hrs
• Introduction to related institutions in Nepal (Land Revenue Office, Survey Offices, DOLIA, Land Reform, Guthi Corporation etc.)
• Basic Introduction about International Organization (FIG, PCGIAP, AARS, ISPRS)

Unit 2: Land policy, Laws and Directives

2.1 Land policy 3 hrs
• Policy: concept and definition
• Policy formulation procedure
• Importance of land policy
• Land Policy in Nepal

2.2 Land Laws in Nepal 5 hrs
• Concepts, needs and definition
• Historical Background
• Law making processes
• Constitution of Nepal (Related sections)
• Land (Survey and Measurement) Act and Rules
• Land related Act and Rule
• Land Revenue Acts and Rule
• Muluki Ain (related section)

2.3 Circulars and Directives 2 hrs
• Land Administration Directives
• Cadastral Survey Directives

Test and Revision 4 hrs
References:

- Land law and registration: S.R. Simpson
- Land registration: B. L. Shrestha
- Bhumi lagat, registration ra kitanapi: 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)
- Kitanapi karyavidhi- Survey Department of Nepal
- Jagga prashashan karyavidhi - Survey Department of Nepal
Civil Construction
EG 3203 SE

Year: III
Semester: II

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

Course Description:
This course includes basic introduction of construction materials, Building construction, Road Construction, Irrigation System, Water Supply and sanitation System, River training works, Estimating and costing.

Course Objectives:
After the completion of this course, students will be able to
1. Explains the major items of work required for building construction
2. Interpret simple road alignment geometry
3. Understand elements of simple irrigation system
4. Understand basics of Water Supply and sanitation system

Course Contents:
Unit 1. Introduction [4 hrs]
1.1. Definition of the construction works
1.2. Elements of the construction works
1.3. Mode of implementing construction works
1.4. Basic of the technical drawings

Unit 2. Construction materials [6 hrs]
Types, characteristics of brick, stones, aggregates, cement, steel and wood

Unit 3 Building Construction [6 hrs]
3.1 Buildings elements
- Foundation & Superstructure (walls, flooring, roofing, doors and windows)
- Stones masonry, Brick Masonry, plain Cement concrete, form work, 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
4.4 Structures (Bridge, Culvert, Retaining wall, breast walls)
4.5 Properties of soil and stone aggregate used in road construction

Unit 5: Irrigation System [6 hrs]
5.1 Concept and importance of irrigation system
5.2 Type 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 and sanitation Systems [8 hrs]
7.1 Sources of water
7.2 Discharge measurement by velocity-area method
7.3 Discharge measurement by bucket-stop watch method
7.4 Introduction to and type of water supply system
7.5 Gravity flow water supply system
4.6 Intake- purpose, major parts of intake, points to consider while selecting the site for intake
4.7 Pipeline – transmission, distribution
4.8 Interruption/ break pressure tank
4.9 Valve chambers
4.10 Distribution chambers
4.11 Treatment of water- sedimentation, filtration, disinfection
4.12 Reservoir tank
4.13 Stand posts

7.6 Spring protection
7.7 Pipe and pipe fittings
7.8 Tools and equipment used in plumbing works
7.9 Ferro cement technology and its application in reservoir construction
7.10 Concept of hydraulics and pipeline design
7.11 Tube well system
7.12 Sanitation system
4.14 On-site sanitation - VIP Latrine, Sulav Latrine, Eco-san Toilet
4.15 Water borne sanitation- toilet with septic tank system, sewer pipeline system, sanitary sewer treatment process

Test and Revision [7 hrs]

Reference Books

1. *Building Construction* Sushil Kumar
2. *Engineering Costing and Supervision* (CTEVT)
3. भवन निर्माण- प्रा.वि. तथा व्या.ता. परिणाम
4. ग्रामीण खाने पनी निर्माण तथा व्यवस्थापन - हरियुसाद शर्मा
6. *Lecture notes on basic construction*
Civil Construction Practical

Unit 1. **Sizing and drawing of Engineering Structures** [22 hrs]
- Sizing and drawing of simple structures based on data obtained from engineering survey field work
- Fixing alignment of a road between two points given on a contour map
- Rural village water supply scheme
- Drawing of simple building
- Drawing of simple irrigation canals

Unit 2. **Outdoor** [8 hrs]
One day field visit of construction site
Quantity Surveying  
GE 3204 SE

Year: III  Total: 5 Hours/week  
Semester: II  Lecture: 2 hours/week  
              Tutorial: 1 hrs/ week  
              Practice: 2 hours/week

Course Description:

- This course includes 5 units which partially covers works related to quantity estimation of Building construction, Road Construction, Water Supply and sanitation works.

Course Objectives:

- The course is aimed at providing the students a background on procedures in quantity estimating of various items of Engineering structures and their specification along with their cost estimates. The students may use this knowledge in evaluation of system as well as monitoring the content during construction time.
- To train the students in technical and analytical skills required to enable them to function and practice professional quantity surveyor on all aspects of civil engineering works.

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

- Explain the different units of measurements used for quantifying the item of construction works
- Explain the major items of work required for construction like building, irrigation, road, watersupply etc.
- Describe the need and procedures of estimating quantity and cost, carry out the rate analysis, quantity estimate and costing of some of the major items of work related to Building, Road etc.

Course Contents:

Unit 1 Introduction  [2 hrs ]

1.1. General
1.2. Systems of units
1.3. Units of measurement and payments for Items of works and materials.
1.4. Requirements of quantity surveying and costing.

4.6 Data required for the preparation of an estimates.

Unit: 2 Types of estimates  [4 hrs ]

2.1 Preliminary estimates
2.2 Plinth area estimates
2.3 Cube rate estimates
2.4 Approximate quantity estimate
2.5 Detailed estimates
2.8 Annual maintenance estimates
2.7 Complete estimates

**Unit: 3 Methods of Estimating/Procedure of estimating**  [6 hrs ]

- 4.16 Main items of works, sub heads of various items of work
- 4.17 Various forms used in estimating
- 4.18 Various methods of taking out quantities
  1. Center line method
  2. Long and short wall method
  3. Crossing method
- 4.19 Method of measurement of various works.
- 4.20 Abstracting bill of quantities.

**Unit 4: Analysis of rates**  [ 8 hrs]

- 4.1 Introduction
- 4.2 Purpose of rate analysis
- 4.3 Factors affecting rate analysis
- 4.4 Rates of materials (Use Government norms)
- 4.5 Procedure of rate analysis for
  a. For Building works
    - Earthwork
    - P.C.C. & RCC
    - Brickwork
    - Formwork
    - Plastering and painting
  b. Water supply and sanitary work
    - Earthwork in excavation in trench
    - Supplying and laying of different types of pipes (RCC, GI, and CI)

**Unit: 5 Detailed Estimates**  (10 hrs)

- 5.5 Estimates of single storey residential building
- 5.6 Estimate of signal tower/ Transmission line and monuments
- 5.7 Estimates of septic tank and soak pit.

**Test and revision**  (15hrs)

**Quantity Surveying Practical**  (30 hours)

*Application of units (1 to 5) in preparation detail estimate*

1. Understanding technical drawings of various engineering structures
2. Estimate of one room building with RCC flat roof
3. Estimate of retaining wall
4. Estimation of signal tower and monuments
5. Septic tank and soak pit
6. Biogas plants

Reference Books

2. M. Chakrawarti “Estimating costing and specification”.
GIS Applications
EG3205GE

Year: III
Semester: II

Total: hours/week
Lecture: hours/week
Tutorial: hours/week

Course Description:

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

Course Objectives:

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

1. Perform simple GIS analysis
2. Understand maps data types 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

Course Contents:

Unit: 1 Data Integration

4.21 Join and relate spatial and attribute data
4.22 Projection and transformation of spatial data

Unit 2: Spatial Analysis [10 hrs]

2.1 Classification and Measurement

4.23 Explain measurement techniques of raster and vector data
4.24 Explain spatial selection queries
4.25 Explain Classification methods (User control classification and automatic classification)

2.2 Overlay functions and Neighborhood Analysis

4.26 Explain vector overlay operation and raster overlay operation
4.27 Explain Neighborhood function (Generating buffer zone)

2.3 3D Analysis

4.28 Define 3D representation of Earth surface
4.29 Explain the methods for generating contours and 3D surface from 3D points
4.30 Introduce followings:
  - Slope/Aspect/Hill-shade
  - Surface area and volume
  - Contour and profile generation
4.31 Define Digital Elevation Model (DEM) and Digital Surface Model (DSM)
4.32 Explain the application of Elevation Model (DEM) in spatial planning

Unit 2: Visualization [15 hrs]
2.1 Introduction

4.33 Define visualization
4.34 Differentiate Hard copy and digital maps

2.2 Map Data Types

4.35 Define and differentiate Map Data Types (Qualitative and Quantitative)
4.36 List and describe Visual Variables
4.37 Understand the application of visual variables to visualize different types of map data

2.3 Types of Maps and Map design Principles

4.38 Differentiate Map Types from users perspective (Static, dynamic and interactive maps)
4.39 Explain thematic maps
4.40 Explain the basic rules for Map Design
4.41 Introduce web maps.

Unit 3: Quality and accuracy of GIS maps/ data [5 hrs]

3.1 Data Quality

4.42 Define Data quality
4.43 Introduce the Elements of data quality
- Spatial accuracy
- Attribute accuracy
- Temporal Accuracy
- Logical Consistency
- Lineage

3.2 Accuracy Assessment

4.44 Define Accuracy and precision
4.45 Explain Error propagation
4.46 Describe RMSE for assessing positional accuracy

Unit 4: GIS Project [5 hrs]

4.1 Problem Identification

4.47 Define problem related to spatial planning of a case

4.2 Project Design

4.48 Design data models required for the project
4.49 List the resources required for the project
4.50 Discuss the possible problems
4.51 List out the expected project outcomes

4.3 Project Implementation
4.52 Prepare the project implementation schedule

4.5 Project Evaluation

4.53 Define project Evaluation

4.54 Setting evaluation criteria

Unit 5: Test and Revision

[10 hrs]

Reference Books

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
GIS Applications (Practical)  
EG3205GE  

Unit 1:  Spatial Analysis  
1.1 Combine data from different sources (join attribute tables, import external data into GIS)  
1.2 Calculate Geometry of raster and vector data  
1.3 Query databases  
1.4 Perform Geo-processing and Computation  
1.5 Generate Buffer Zone (point, line, Polygon buffer)  
1.6 Convert Vector to raster and raster to vector  

Unit 2:  3D Analysis  
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  
3.1 Compose maps  
3.2 Generalize map elements  
3.2 Apply Cartographic principles of map design  
3.3 Use appropriate Color in maps  
3.4 Symbolize features  
3.5 Place features and Geographic names  
3.6 Label features  
3.7 Insert legend north arrow, grid, scale, title, projection information, map notes  
3.8 Export maps in to different formats  

Unit 4:  Thematic Mapping  
4.1 Visualize themes in maps (Using Graduated Color, Graduated symbols, Proportional symbols, and dot density)  
4.3 Compose maps and show the thematic information using appropriate Graphs and charts
Unit 5: Project Work  [10hrs+30 hrs]

5.1 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.

5.2 The project work will be based on the following cases.

- Topographic mapping
- Digitization and map preparation
- Terrain Modeling and 3D analysis
- Land planning/ plotting and mapping
- Thematic mapping
- Suitability analysis
- Socio-economic analysis
Engineering Survey
EG 2205GE

Year: III
Semester: II

Total: 7 hours/week
Lecture: 2 hours/week
Tutorial: 1 hours/week
Practical: 4 hours/week

Course Description:
This course focuses on theoretical and practical knowledge of surveying related to different engineering project.

Course Objectives:
After the completion of this course, students will be able to
- Understand the concept of engineering surveying
- Perform the surveying related to different construction project

Course Contents:
Unit 1. Introduction to Engineering Survey 4hrs
1.1 Survey Component in various engineering construction Projects.

Unit 2. Route Survey 5hrs
2.1 Meaning and concept of routes
2.2 Surveying for different types of Routes (Road, Irrigation, Water Supply, Transmission line etc)
2.3 Plan, Profile, cross section

Unit 3. Curve 10hrs
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 by :
   4.55 Method of offset from long chord
   4.56 method of offset from Tangent
   4.57 Rankin's Method of deflection angle
3.5 Vertical curve
3.6 Concept of transition curve.

Unit 4. Area and Volume 10hrs
4.1 Area of different geometrical figures
4.2 Area measurement of Irregular figure
4.58 Average ordinate method
4.59 Trapezoid method
4.60 Simpson's method
4.3 Area measurement by coordinates
4.4 Area determination by graphical method (on the map)
4.61 By square grids
4.62 By planimeter
4.5 Volume of different geometrical shapes (Cube, Parallelepiped, sphere, cylinder, and Cone)
4.6 Determination of volume by:
4.63 Area of cross section method (one level section)
4.64 Spot heights
4.65 Contour maps
4.7 Mass haul

Unit 5. Site Survey 5hrs

2.4 Introduction
2.5 Site Survey for different purposes
2.6 Site survey for Building, Bridge, Dam, Power House etc.
2.7 Methods of site survey
2.8 Establishment of control points and Bench Marks.
2.9 Computation and Plotting field data
2.10 Preparation of plans and profiles for different component of construction site
2.11 Transfer of the map data on the ground

Unit 6. Hydrographic Survey 5hrs

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 water
6.5 Measurement of Discharge by Area of cross section method
6.6 Methods of locating the soundings.

Test and Revision 6hrs

References

# Engineering Survey - Practical

**Unit 1. Indoor**

- **1.1** Computation of existing field data for engineering surveys
- **1.2** Plotting of existing data
- **1.3** Preparation of Plans and Profiles
- **1.4** Earth work estimation

**Unit 2. Outdoor**

- **2.1** Route Survey (Road alignment, Geometric design)
- **2.2** Bridge site Survey
- **2.3** Setting out simple circular curves by Tape and theodolite
- **2.4** Discharge measurement of a river (float and current water)
Project Work
EG 3206GE

Total: 8 hour /week
Year: III
Lecture: hours/week
Semester: II
Tutorial: hours/week
Practical: 8 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:
7. The Project work will be based on any one of the following themes/topics
8. 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.

**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