TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

CURRICULUM

BACHELOR'S DEGREE COURSE IN CIVIL ENGINEERING

1987

R.B. Shrestha
B.E. III rd yr.

FOREWORD

A course to produce professional Civil Engineers was introduced in Nepal, for the first time, in the academic year 1978/79 by the Institute of Engineering, Tribhuvan University. A second batch of students was admitted in the following year. The admission was then discontinued for next four years for internal reasons.

The reorganisation in the educational system of the country at the University level necessiated conceiving a four year Bachelor's degree course in Civil Engineering under a fresh scheme. The entry to this course is allowed from two streams viz. technicians and those with science background. The curriculum of this course is an outcome of numerous discussions held within the Faculty Board (which approved), the Civil Engineering Subject Committee (which recommended to the Faculty Board) and during various meetings held to interact with representatives of employing agencies. The draft was prepared by a number of subject specialists. Many members of the faculty and in particular, Civil Engineering Subject Committee have contributed extensively in finalising this curriculum.

This curriculum was introduced from the academic year 1984/85.

Dean's Office
Institute of Engineering
Pulchowk, Lalitpur,
NEPAL.

dated : April 16, 1989
(2046/1/4)

(Sudarshan Raj Tiwari)
Dean

CONTENTS

I. INTRODUCTION

This course with an aim to produce high level technical manpower capable of undertaking works in Civil Engineering field is offered at Pulchowk Campus of the Institute of Engineering, Tribhuvan University, located at Pulchowk, Lalitpur, Nepal. The details of the course are as follows :

1.1 Title of the Course :

Bachelor of Engineering in Civil Engineering.

1.2 Objective of the Course :

To train students in technical and analytical skills required to enable them to function and practice as professional Civil Engineers on all aspects of Civil Engineering works.

Students, on the successful completion of this course, will be able to

(a) carry out design, supervision, management works related to building, road, irrigation, public health and other Civil Engineering works;

(b) carry on post graduate level courses in the specialised fields of Civil Engineering.

1.3 Duration of the Course :

The total duration of the course is 4 years. Each year consists of two parts, A and B, each part having a duration of minimum 90 working days (about 15 weeks).

II. ENTRY REQUIREMENTS

2.1 Minimum Requirements :

The minimum requirements for admission to the course are :

(a) Successful completion of Proficiency Certificate in Science* of Tribhuvan University or equivalent including achievement of aggregate percentage of marks not less than that prescribed** by the Faculty Board of the Institute

OR,

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* Two year course in science for those having studied ten years in school and passed School Leaving Certificate (S.L.C.) examination.

** Currently 50%.

Successful completion of Proficiency Certificat in Civil Engineering*** of Tribhuvan University or equivalent including****, and

(b) Successful completion of entrance examinations prescribed***** by the Faculty Board of the Institute and conducted by the Pulchowk Campus at the time of admission.

2.2 Selection :

Students fulfilling the minimum requirements will be selected for admission on the basis of merit (average of aggregate percentage of marks secured in the prerequisite certificate level course and aggregate percentage of marks obtained in the entrance examinations).

The subjects of entrance examination for the two entry streams will be different and the number of seats available for each entry stream is predetermined.

3. COURSE STRUCTURE

3.1 Contents :

The teaching of the course is divided into 8 parts (half yearly). The first two parts are of prerequisite nature and are different for the two entry streams. The students with science background will study fundamental engineering subjects related to Civil Engineering whereas the students from technician stream will study basic sciences and mathematics.

In the second year and onwards, common to both streams students will study subjects related to basic principles to be used in varied applications of Civil Engineering along with applied sciences and management. In the final year electives are also offered with an objective of imparting to the students an advanced knowledge of a specialized subject. The final part of the course includes a project work and a study tour which will expose the students to the practical aspects of Civil Engineering works.

*** Three year course (previously two year) in civil engineering for those having studied ten years in school and passed S.L.C. examination.

**** Currently 50%.

***** Currently, candidates must obtain 40% in each of the entrance examination papers and 50% in aggregate.

3.2 Subject Codes :

Each subject offered is coded with a unique number preceded and followed by certain letters. The code for all the subjects offered in engineering disciplines begin with two letters 'EG', followed by three digit numbers denoting the subject offered in the particular half yearly part. The first digit denotes the year, i.e. 4,5,6,7 for the first, second, third and fourth year of the Bachelor's level course, respectively. The second digit from 0 to 4 are used for the first part of a year and 5 to 9 for the second part of a year. The third digit is used to differentiate subjects. The last letters denote the department which offers the subject.

Example : EG 515 CE is the code for the subject. Engineering Mechanics which is offered in the engineering discipline in the second year Part A of the Bachelor Course and is conducted by the Civil Engineering Department.

3.3 Instruction Methods :

The method of teaching is lectures augmented by tutorials and practical works. Tutorials are used to enlarge and develop the topics and concepts stated in lectures. Practical classes in the form of laboratory works, drawing office practice and field works, are used to verify the concepts and to develop necessary technical and analytical skills.

4. EXAMINATION AND MARKING SCHEME

the students' achievement is evaluated by an examination at the end of each part (also called half yearly examination) and internal assessment during the course of each part. A weightage of 20% for the internal assessment and that of 80% for the half yearly examination are allocated for the theory component of a subject. The popular mode of internal assessment of a theory component has been written tests, although other modes are also available for use. The half yearly examinations of all theory components must be conducted through written tests. With regards to practical components the method of continuous assessment is adopted; in some cases, half yearly examinations are also conducted. Students must obtain 40% in the internal assessment and 40% in the half yearly examination of each subject, as pass marks. Students who have not obtained the prescribed pass marks in the internal assessment of a subject are not allowed to sit in the half yearly examination of the subject.

Students who have passed all the components of all the subects in all of the eight parts are considered to have successfully completed the course. The overall achievement of each of such students is measured by a final aggregate percentage which has been obtained by providing a weightage to each of half yearly aggregate percentages scored by the student as prescribed below :

First & Second Years	:	20% each
Third & Fourth Years	:	30% each

Depending upon the final aggregate percentage scored, a division is award as follows :

80% and above	:	Distinction
65% and above	:	First Division
50% and above	:	Second Division
40% and above	:	Pass.

YEAR I : PART A
TECHNICIAN INTAKE

Course No.	Course Titles	Teaching Schedule			Examination Scheme						REMARKS
					Theory			Practical			
					Assessment	Final		Assessment	Final		
		L	T	P	Marks	Duration Hrs	Marks	Marks	Duration Hrs	Marks	
-11 Eng	English	2	3	-	20	3	80	-	-	-	
-12 Math	Mathematics I	3	2	-	20	3	80	-	-	-	
-13 Math	Mathematics II	3	2	-	20	3	80	-	-	-	
-14 Phy	Physics I	3	1	-	20	3	80	-	-	-	
-15 Phy	Physics II	3	1	-	20	3	80	-	-	-	
-16 Chem	Chemistry I	2	2	-	20	3	80	-	-	-	
-17 Chem	Chemistry II	3	1	-	20	3	80	-	-	-	
-18 Phy	Physics Practical	-	-	2	-	-	-	10	3	15	
-19 Chem	Chemistry Practical	-	-	2	-	-	-	10	3	15	
	TOTAL	19	12	4	140	21	560	20	6	30	Total Marks = 750

YEAR I : PART B
TECHNICIAN INTAKE

S. No.	Course Codes	Course Titles	Teaching Schedule			Examination Scheme						REMARKS
						Theory			Practical			
						Assesment	Final		Assesment	Final		
			L	T	P	Marks	Duration Hrs	Marks	Marks	Duration Hrs	Marks	
1.	EG.451	Eng English	2	3	–	20	3	80	–	–	–	
2.	EG.452	Math Mathematics III	3	2	–	20	3	80	–	–	–	
3.	EG.453	Math Mathematics IV	3	2	–	20	3	80	–	–	–	
4.	EG.454	Phy Physics III	3	1	–	20	3	80	–	–	–	
5.	EG.455	Phy Physics IV	3	1	–	20	3	80	–	–	–	
6.	EG.456	Chem Chemistry III	2	2	2	20	3	80	10	3	15	
7.	EG.457	CE Engineering Drawing (Machine Drawing)	1	–	4	–	–	–	60	3	40	
8.	EG.458	Phy Physics Practical	–	–	2	–	–	–	10	3	15	
		TOTAL	17	11	8	120	18	480	80	9	70	Total Marks = 750

YEAR I : PART A
SCIENCE INTAKE

Course Codes	Course Titles	Teaching Schedule L	T	P	Examination Scheme: Theory Assesment Marks	Theory Final Duration Hrs	Theory Final Marks	Practical Assesment Marks	Practical Final Duration Hrs	Practical Final Marks	REMARKS
EG.411 Eng	English	2	3	-	20	3	80	-	-	-	
EG.420 CE	Engineering Drawing (Geometric Drawing)	1	-	4	-	-	-	60	3	40	
EG.421 CE	Engineering Materials	3	-	2	20	3	80	50	-	-	
EG.422 CE	Surveying I	3	-	4	20	3	80	80	V.V	20	Viva Voce
EG.423 CE	Building Construction	2	-	4	20	3	80	50	-	-	
EG.424 CE	Workshop I	1	-	4	-	3	-	80	V.V	20	Viva Voce
	TOTAL	12	3	18	80	15	320	320	3	80	Total Marks = 800

SCIENCE INTAKE

S. No.	Course Codes	Course Titles	Teaching Schedule			Examination Scheme						REMARKS
						Theory			Practical			
						Assessment	Final		Assessment	Final		
			L	T	P	Marks	Duration Hrs	Marks	Marks	Duration Hrs	Marks	
1.	Eg.451 Eng	English	2	3	–	20	3	80	–	–	–	
2.	EG.457 CE	Engineering Drawing (Machine Drawing)	1	–	4	–	–	–	60	3	40	
3.	EG.459 CE	Estimating	2	–	4	20	3	80	–	–	–	
4.	EG.460 CE	Mechanics of Structures	4	1	–	20	3	80	–	–	–	
5.	EG.461 CE	Surveying II	3	–	4	20	3	80	80	V.V	20	Viva Voce
6.	EG.462 CE	Workshop II	1	–	4	–	–	–	80	V.V	20	Viva Voce
		TOTAL	13	4	16	80	12	320	220	3	80	Total Marks = 700

YEAR II : PART A

	Teaching Schedule Course Titles	L	T	P	Theory Assessment Marks	Theory Final Duration Hrs	Theory Final Marks	Practical Assessment Marks	Practical Final Duration Hrs	Practical Final Marks	REMARKS
...ny	Physics V	2	2	2/2	20	3	80	10	3	15	
...hem	Chemistry IV	2	2	2/2	20	3	80	10	3	15	
...ath	Mathematics V	4	2	–	20	3	80	–	–	–	
...E ...E	Principles of Elect. Engineering* Electrical Engg.	4	–	2/2	20	3	80	25	–	–	
...E	Engineering Mechanics	3	1	–	20	3	80	–	–	–	
...E ...E	Mechanical Technology* Mechanical Technology	3	1	2	20	3	80	25	–	–	
...E	Surveying III	3	–	4	20	3	80	50	–	–	
	TOTAL	21	8	9	140	21	560	120	6	30	Total Marks = 850

...icable to students admitted in 041/42 and 042/43 only.

S. No.	Course Codes	Course Titles	Teaching Schedule			Examination Scheme						REMARKS
						Theory			Practical			
			L	T	P	Assessment Marks	Final Duration Hrs	Final Marks	Assessment Marks	Final Duration Hrs	Final Marks	
1.	EG.551 Phy	Physics VI	2	2	2/2	20	3	80	10	3	15	
2.	EG.552 Math	Mathematics VI	4	2	–	20	3	80	–	–	–	
3.	EG.553 EE	Basic Electronics	3	2	–	20	3	80	–	–	–	
4.	EG.554 CE	Strength of Materials	4	2	2/2	20	3	80	25	–	–	
5.	EG.555 CE	Fluid Mechanics	3	1	–	20	3	80	–	–	–	
6.	EG.526 CE EG.556 CE	Engineering Geology* Engineering Geology	3	1	2/2	20	3	80	25	–	–	
7.	EG.557 CE	Surveying IV	2	2	2	20	3	80	50	–	–	
8.	EG.558 CE	Surveying Field Work		2					100	V.V	–	Viva Voce
		TOTAL	21	12	5	140	21	560	210	3	15	Total Marks = 925

(weeks)

Courses applicable to students admitted in 041/42 and 042/43 only.

YEAR III : PART A

		Teaching Schedule				Examination Scheme						
						Theory			Practical			
se	Course					Assessment	Final		Assessment	Final		REMARKS
s	Titles	L	T	P		Marks	Duration Hrs	Marks	Marks	Duration Hrs	Marks	
311 CE	Structural Mechanics I	4	2	2/2		25	3	100	25	–	–	
312 CE	Hydraulics	3	1	2/2		25	3	100	25	–	–	
313 CE	Engineering Hydrology	2	1	–		25	3	100	–	–	–	
314 CE	Design of Structure I	4	3	–		25	3	100	–	–	–	
315 CE	Computer Programming & Numerical Methods	3	–	3		25	3	100	50	–	–	
316 Math	Mathematics VII	4	2	–		25	3	100	–	–	–	
	TOTAL	20	9	5		150	18	600	100	–	–	Total Marks = 850

YEAR II : PART B

Teaching Schedule	Examination Scheme

YEAR III : PART B

S. No.	Course Codes	Course Titles	Teaching Schedule L	T	P	Examination Scheme: Theory Assessment Marks	Theory Final Duration Hrs	Theory Final Marks	Practical Assessment Marks	Practical Final Duration Hrs	Practical Final Marks	REMARKS
1.	EG.651 CE	Soil Mechanics	3	1	2	25	3	100	25	–	–	
2.	EG.652 CE	Highway Engineering I	4	1	–	25	3	100	25	–	–	
3.	EG.653 CE	Open Channel Hydraulics	3	1	2/2	25	3	100	25	–	–	
4.	EG.654 CE	Structural Mechanics II	4	2	2/2	25	3	100	25	–	–	
5.	EG.655 CE	Advanced Bldg.Technology	4	–	–	25	3	100	–	–	–	
6.	EG.656 CE	Water Supply Engineering	3	1	2/2	25	3	100	25	–	–	
		TOTAL	21	6	5	150	18	600	125	–	–	Total Marks =

YEAR IV : PART A

Course Codes	Course Titles	Teaching Schedule L	T	P	Examination Scheme: Theory Assessment Marks	Theory Final Duration Hrs	Theory Final Marks	Practical Assessment Marks	Practical Final Duration Hrs	Practical Final Marks	REMARKS
.711 CE	Foundation Engineering	3	2	-	25	3	100	25	-	-	
.712 CE	Design of Structure II	4	-	3	25	3	100	50	-	-	
.713 CE	Highway Engineering II	5	-	2	25	3	100	25	-	-	
.714 CE	Irrigation Engineering	3	1	-	25	3	100	25	-	-	
.715 CE	Sanitary Engineering	3	1	2/2	25	3	100	25	-	-	
.716 CE	Construction Management II	3	1	-	25	3	100	-	-	-	
	TOTAL	21	5	6	150	18	600	150	-	-	Total Marks = 900

YEAR IV : PART B

Course	Course Titles	Teaching Schedule			Examination Scheme						REMARKS
					Theory			Practical			
					Assessment	Final		Assessment	Final		
		L	T	P		Duration Hrs	Marks	Marks	Duration Hrs	Marks	
751	CE Water Power Engineering	3	1	2/2	25	3	100	25	-	-	
752	CE Urban & Regional Planning	3	1	-	25	3	100	-	-	-	
753	CE Construction Management II	4	1	-	25	3	100	-	-	-	
754	CE Project Work	-	-	7	-	-	-	200	v.v.	50	Viva Voce
	Elective I*	3	2	-	25	3	100	-	-	-	
	Elective II*	3	2	-	25	3	100	-	-	-	
	TOTAL	16	7	8	125	15	500	225	-	50	Total Marks = 900

from EG 755 CE (depending upon courses offered).

SCIENCE AND HUMANITIES COURSES

Courses in English

The objective of the course is to enable the students to communicate in english language. With this aim English I and English II are offered in A and B part of I year respectively. The courses common to both technician and science intakes impart the knowledge of spoken english, vocabulary, grammatical structures and comprehension etc.

Courses in Physics

The objective of the courses in Physics is to impart basic knowledge for higher engineering course.

After completion of the courses Physics I, II (Part A) and Physics III, IV which are offered in I year for technician intake, the students will have a basic knowledge of Physics (contents equivalent to that of certificate in Science).

The course contents of Physics V and VI (2nd year) are framed so as to impart necessary basic knowledge as a prerequisite to the engineering science. The courses include broad areas of studies in Optics, Heat, Current Electricity, Electrostatics and Modern Physics etc.

Courses in Chemistry

The objective of courses Chemistry I, II (Part A) and Chemistry III (Part B) given in I year for technician intake is to equip the students with the basic knowledge of chemistry (course contents equivalent to that of certificate in Science).

The course prescribed in Chemistry IV will enable the students to have an understanding of a fairly advanced knowledge of physical, inorganic and organic chemistry, which will help them to understand the Physics-Chemical principles involved in the preparations, properties and uses of certain engineering materials.

Courses in Mathematics

The overall aim of the courses in Mathematics is to give a sound knowledge in mathematics as an important pre-requisite for the development and understanding of engineering concepts.

The objective of Mathematics I, II (Part A) and Mathematics III, IV (Part B) offered in I year for technician intake is to impart the students with knowledge of basic mathematics (contents as that of certificate in Science) and to bring to the part of that of Science intake.

Starting from 2nd year Part A, the courses Mathemetics V, VI and VII are common and are basis for engineering concepts. The objective of these courses is to make the students to be able :

- to use differential and integral calculus in simple practical problems,
- to frame and solve differential equations in Engineering problems,
- to apply analytical approach to geometrical problems.
- to make further studies in mathematics required for research purposes in Engineering applications.

ENGLISH - I
EE 411 ENG

Lecture : 2
Tutorial : 3

Year : I
Part : A (common)

Unit 1. Spoken : 1. Sound System -

Speech mechanism and organs sources. Pitch quality, articulation phoneme, morpheme, allphone vowels, dipthongs, consonants, using audio-visual aid.

2. Stress/Accent -

Primary and secondary stress, stresses/ unstressed syllables, rules of stress, using audio-visual aid.

3. Rhythm and Intonation -

Rhythm units, ex. in verse,
functions/attitudes
falling
rising
falling - rising
using audio-visual aid.

4. Sound Change/Juncture -

Words in company
connected speech
word boundaries
vowels and consonants
using audio-visual aid.

Unit 2. Vocabulary : Pronounciation -

Using dictionary, word-meaning use of words.

Unit 3. Grammer : Preposition
Conditional
acceptability and intelligibility
exercises as required i.e.
verbs, voice, clauses.

Unit 4. Reading : Reading selected passages
searchings information
finding facts
exercises from text.

Unit 5.	Writing	:	Short and long answers note taking, summing up letter, application.
Unit 6.	Composition	:	Descriptive and narrative guided composition on specific topics

ENGLISH - II
EG 451 ENG

Lecture : 2
Tutorial : 3

Year : I
Part : B (common)

Unit 1.	Spoken and Vocabulary	:	Pronounciation Writing from cassettes Using dictionary Using audio-visual aid.
Unit 2.	Grammer	:	Concords : Number - singular/plural Person - personal/reflexive Varieties of English. Redundancy - appropriate/inappropriate.
Unit 3.	Reading	:	Reading selected passages Newspaper - reading concerned topics Oral comprehension.
Unit 4.	Writing	:	Long and short answers Dialogue, message, report.
Unit 5.	Composition	:	Discussions and summing up Free composition on specific topics Home assignments.

PHYSICS - I
EG 414 PHY

Year : 1
Part : A (Technician Intake)

Lecture : 3
Tutorial : 1

MECHANICS :

1. Review of :

   (a) Measurements of physical quantities, standard unit, S.I. unit, introductory ideas about dimensions of physical quantities.

   (b) Scalars & Vector : definition and examples.

   (c) Dynamics : motion in a straight line, uniform and variable motion, equations for motion in a straight line and motion under gravity.

   (d) Composition and resolution of vectors : resultants, components parallelogram of forces, triangle of forces, Lami's theorem; forces inequillibrium, relative velocity and relative acceleration, centre of mass, type of equillibrium, stable, unstable and neutral equillibrium.

   (e) Newton's laws of motion : 1st, 2nd & 3rd laws, principle of conservation of momentum, solid friction, laws of solid friction and its verification.

   (f) Work, energy and power : potential and kinetic energy, conservative and non-conservative forces elastic and inelastic collision, principle of conservation of energy.

2. Circular motion : acceleration in a circle, centrifugal force and centrifuges, motion of a bicycle rider round a circular track banking of track.

3. Simple harmonic motion & its characteristics, simple pendulum.

4. Gravitation : Newton's laws of gravitation, variation of g, mass & density of the earth.

5. Motion of a projectile, motion of a satellite, weightlessness.

6. Rotation of rigid bodies, moment of inertia, torque on a body, angular momentum and its conservation.

7. Hydrostatics :

(a) Fluid pressure, Pascal's law of transmission of liquid.

(b) Archimedes principle and its varification, density and specific gravity, determination of sp. gr. solid and liquid, principle of floatation, stability of floating bodies, hydrometers and their principle.

(c) Pnumation : atmospheric pressure and its measurement, Boyle's law & its barification, air pumps, siphons and its working.

8. Properties of Matter :

(a) Elasticity : Particulate nature of matter, inter-molecular forces, elasticity of metals, stress, strain and elastic limit, hooke's law and coefficient of elasticity.

(b) Viscosity : Newton's formula, coefficient of viscosity, units and dimensions, terminal velocity, stokes law.

(c) Surface Tension : Surface tension phenomena, angle of contact capillarity, surface tension of water.

HEAT :

1. Review of :

(a) Concept of heat & temperature and their measurements, temperature scale, thermal equilibrium.

(b) Thermal Expansion :

(1) Solid : Linear & cubical expansion and their relation, measurement of coeff. of linear expansion, force set up due to expansion. Expansion of measuring scale, differential expansion, bemettalic strip, thermostat.

(2) Liquid : Real and apparent expansion of liquid, change of density with temperature, measurement of real and apparent expansion of liquid, correction of barometer, anamalous expansion.

(3) Calorimetry : Heat capacity, specific lheat capacity, measurement of sp. heat, capacity of solid and liquid.

(4) Change of Phase : Heat of transformation, determinacion of latent heat of fusion of ice & latent heat of steam, melting & freezing.

super cooling, pressure and melting points, regulation.

(5) Gas : Expansion of gas, pressure coefficient and volume coefficient, equality of pressure coefficient and volume coefficient, absolute temperature, the universal gas constant sp. heat capacity and molar heat capacity, relation between C_p and C_v.

(6) Kinetic theory of Gases : Calculation of pressure and derivation of different gas laws.

(7) Saturated and Unsaturated Vapours : Behaviour of saturated vapour, variation of s.v.p. with temp. boiling point of a liquid, effect of altitude on boiling point, triple point.

(8) Review of dew point, absolute humidity, dryness and dampness relative humidity and its determination.

(9) Transfer of Heat : Conduction, convection and radiation, coefficient of thermal conductivity, the black body radiation.

(10) Heat Engines : Steam engine and internal combustion engine.

PHYSICS PRACTICAL - I
EG 418 PHY

Time : 2 hrs./wk.

Year : I
Part : A (Technician Intake)

List of Experiments :

1. To use vernier callipers to determine the length, external diameter and internal diameter of the given hollow tube and hence calculate its volume and their density.

2. To use a simple pendulum to determine the length of a second pendulum and the value of g in the laboratory.

3. To determine the surface tension of water by capillary tube.

4. To use a Hydrostatic Balance to determine the sp. gr. of solid :

   (a) heavier than and insoluble in water,
   (b) a solid lighter than and soluble in water.

5. To use a Boye s law apparatus to determine the atmospheric pressure in the laboratory without using a barometer.

6. To determine the sp. heat of a solid by the method of mixture.

7. To determine the latent heat of fusion of ice.

8. To verify the law of reflection of light and show that object distance and image distance are equal.

9. To determine the focal length of concave mirror by double pin method.

10. To determine the focal length of convex laws by displacement method.

11. To determine thickness of the given glass slab by refraction method (lateral shift).

12. To draws I - D curve for the given prism and determine its refractive index.

13. To determine the velocity of sound in air in the laboratory by resonance air column method and hence calculate velocity in dry air at NTP using, sonometer.

14. To determine the frequency of given tuning fork using, sonometer.

7. Optical Instruments :

Human eye, defects of vision and their removal, telescopes, microscopes, projectors, camera, spectrometer.

8. Physical Optics :

Wave nature of light, Huygen's principle, interference of light, coherent sources, optical path, Young's double slit experiment, diffraction, resolving power, polarization.

SOUND :

(1) Wave motion & its representation.

(2) Sound transmission and its detecting velocity of sound in air (gas), 'Laplace's correction, effect of temperature, pressure & humidity.

(3) Characteristics of Sound : Musical intervals, beats-beats frequency formula, uses of beat, Doppler's effect, intensity and loudness, the decibel. intensity level, quality of timbre audible, ultra sonic & infrasonic waves, reverberation accoustics of auditorium.

(4) Wave in Pipes : Stationary waves, waves in pipes, overtones of closed pipes and open organ pipes, and correction, resonance.

Wave in String : Vel. of transverse wave along a stretched string, modes of vibration Overtone's laws of vibration of string and its verification by sonometer.

PHYSICS - III
EG 454 PHY

Lecture : 3
Tutorial : 1

Year : I
Part : B (Technician Intake)

ELECTROSTATICS :

1. Electrification :

Electrification by friction, positive and negative charges, conductor and insulator, gold leaf electro-scope, induction, charging by induction, Faraday's ice pail experiments, distribution of charge surface density.

2. Electrostatic Field :

Coulomb's law, concept of electric field, concept of flux, Gauss's theorem and its application.

3. Electric Potential :

Potential in fields, potential difference, analogy with gravitation, potential at a point, potential gradient and intensity.

4. Capacitance :

Description of capacitor as a device for holding charge parallel plate capacitor, factors determining capacitance.

CURRENT ELECTRICITY :

1. Current :

Rate of flow of charge, sources of current, dry cells and load acid accumulator, E.M.F. & potential.

Resistance :

Resistivity: property of material, Ohm's law and its varification, resistors in series and parallel, electrical power, electrical heating, Joule's law of heating effect, brief reference of Kirchhoff's laws and its application, thermoelectricity.

2. Electrical Measurements :

Potential divider, simple ammeter and voltmeter, shunt and its uses, internal resistance of cells and meter potentiometer, Wheatstone's bridge principle and its application in meter bridge and P.O. box.

3. Chemical Effects :

Faraday's law of electrolysis and its verification.

4. Induction :

Induced E.M.F. – Faraday's law, direction of E.M.F. by Lenz's law, electrical generator, motor, transformer, self & mutual indiction.

5. A.C. Circuits :

Nature and advantages of alternating current, measurement of alternating current, R,M,S, value, alternating current through capacitor, an inductor.

PHYSICS - IV
EG 455 PHY

Lecture : 3
Tutorial : 1

Year : I
Part : B (Technician Intake)

MAGNETISM :

1. Magnets, magnetic pole, magnetic moments, magnetic axis, magnetic field, lines of force, magnetic meridian, neutral point, intensity of magnetisation, field due to a bar magnet, tangent law, deflection and vibration magnetometer and their uses.

2. Magnetic force and field; force on a charged body direction of current and field. Dependence of force on physical factor, force on moving charge, the moving coil galvanometer, Watt-meter. Ampare's law, law of Bion & Savart.

3. Magnetic properties of materials; properties of dia, para & ferro-magnetic materials, domain theory, earth's magnetism horizontal & vertical component, variation and dip.

MODERN PHYSICS :

1. Basic unit of charge; particle nature of electricity, Millikan's experiment for the determination of electronic charge.

2. Electron in a vacuum; discharge of electricity through gases. Cathode ray and its properties, acceleration of electrons by an electric and magnetic field. Thomson's method for e.m.f.

Photo electric effect; photo electric current and e.m.f, Einstein photo electric equation, determination of Plank's constant. Atomic physics; Bohr theory and different spectral series, Energy level diagram, x-ray; nature, production and application.

Nuclear Physics; Radioactivity-properties of X, B, and Y-rays, half life period, disinter rating consant, average life, laws regarding radioactive transformation, nuclear fission & fusion.

Electronics; thermionic emission, diode and its characteristics and its application as a rectifier. Triode and its characteristic different valve. Parameters, their application as an amplifier and oscillator, semi-conductor - P type and N type semi-conductor, junction transistor and its principle of working.

PHYSICS PRACTICAL - II
EG 458 PHY

Time : 2 hrs./wk.

Year : I
Part : B (Technician Intake)

List of Experiments :

1. To verify Ohm's law by using ammeter and voltmeter.
2. To determine specific resistance of a given wire by using meter bridge and post office box.
3. To determine internal resistance of a cell using p.o. box.
4. To compare e.m.f. of the two given cells using potentiometer.
5. To determine the value of J experimentally.
6. To study the variation of thermo e.m.f. with temperature.
7. To determine the magnetic moment of a magnet by drawing lines of force.
8. To determine the strength of a given bar magnet using deflection magnetometer and oscillation magnetometer.
9. To determine the value of dip. in the laboratory.
10. To study the characteristic curve of a triode valve and then to determine the valve constant.
11. To study the photo electric cell.
12. To study the characteristic curve of a transistor.

PHYSICS V
EG 511 PHY

Year : II
Part : A

Lecture : 2
Tutorial : 2
Practical : 2/2

1. Geometrical Optics :

1.1 Combination of lens
1.2 Defects in the formation of image by lens
1.3 The objective and the eye piece
1.4 Construction and action of Ramsden's and Huygen's eye piece.

2. Physical Optics :

2.1 Interference in thin flim
2.2 Newton's rings
2.3 Fresnel and Fraunhofer diffraction
2.4 Fraunhofer diffraction at a single slit
2.5 Fraunhofer diffraction at two slits
2.6 Diffraction by a plane transmission grating
2.7 Resolving power of telescope and microscope
2.8 Polarisations
2.9 Brewster's law
2.10 Double refraction
2.11 Nicol prism
2.12 Production and analysis of plane, circularly and elliptically polarised light
2.13 Optical activity and polarimeter.

3. Heat :

3.1 Kinetic theory of gases
3.2 Maxwell Boltzmann distribution
3.3 Perfect gas equation
3.4 Van - der wall's equation
3.5 Elementary theory of transport phenomenon
3.6 Diffusivity
3.7 Viscosity
3.8 Conductivity
3.9 Laws of thermodynamics
3.10 Carnot cycle
3.11 Reversible and irreversible process
3.12 Entropy
3.13 Calculation of change in entropy
3.14 Thermoelectricity

4. Acoustics :

4.1 Acoustics of auditorium
4.2 Intensity level of a note
4.3 Decibel

4.4 Reverberation time of reverberation (no derivation)
4.5 Optimum reverberation
4.6 Determination of time of reverberation
4.7 Absorption of sound
4.8 Measurement of absorption coefficient by reverberation chamber method
4.9 Notes and its insulation
4.10 Ultrasonics - its production, properties and uses.

List of Laboratory Works :

1. To determine the viscosity of water by capillary flow.

2. To determine the thermal conductivity of a bad conductor by Lee's method.

3. To determine the value of mechanical equivalent of heat with Callendar and Borns Continuous flow Calorimeter.

4. To determine the dispersive power of the given material of the prism.

5. To determine the wave length of sodium light by Newton's time method.

6. To determine the specific rotation of Cane Sugar Solution.

7. To determine the wave length of mercury light with a diffraction grating.

8. To determine wave length of sodium light by Young's double slit method.

References :

1. A text book of heat - Brij lal and Subrahmanyam
2. A text book of heat - J. B. Rajam
3. Optics - D. N. Vasudeva
4. Optics - Brij lal and Subrahmanyam
5. A text book of sound - Khanna and Bedi
6. Waves and oscillation- Brij lal and Subrahmanyam.

PHYSICS VI
EG 551 PHY

Year : II
Part : B

Lecture : 2
tutorial : 2
practical : 2/2

1. Basic Laws of Electricity :

1.1 Gauss theorem

1.2 Application of Gauss theorem

1.3 Charges in motion

1.4 Laws of electromagnetism

1.5 Lorentz force

1.6 Motion of charged particles in electric fields

1.7 Motion of charged particles in magnetic fields

1.8 Magnetic shells

1.9 Solenoids

1.10 Force between parallel conductor

1.11 Co-axials coils

1.12 Simple magnetic circuits

1.13 Effects of an air gap on magnetic circuits

2. Elements of Atomic and Modern Physics

2.1 Structure of matter

2.2 Different quantum number introduced to define an electron in an orbit

2.3 Types of spectrum

2.4 Continuous X ray spectra

2.5 Characteristics X ray spectra

2.6 Absorption spectra

2.7 Paule's exclusion principle

2.8 Elementary ideas about the structure of solid

5. To study cathode ray oscillograph.

6. To find the value of electronic charge.

7. To find the ratio of e/m.

References :

1. Atomic Physics - J. B. Rajam

2. Eng. Physics - R. K. Gaur and S. L. Gupta

3. Electricity and Magnetism - Khandewell

4. A Text Book of Practical Physics - Indu Prakash and Ram Krishna

CHEMISTRY - I
EG 416 CHE

Year : I
Part : A (Technician Intake)

Lecture : 2
Tutorial : 2

1. Chemical Notations :

Elements and compounds, metals and non-metals, symbols, formulae valency, positive and negative radicals (revision lectures only).

2. Chemical Equations :

Significances and limitations, balancing of chemical equations (hit and trial method, method of partial equations).

3. Atomic Structure :

Discovery of electrons and nucleus, other fundamental particles (Protons and neutrons). Rutherford model, Bohr model of atom, atomic number, mass number, isotopic mass, and atomic weight, concept of quantum numbers, pauli exclusion principle, Aufbau principle, Hund's rule, electronic configuration in terms of s.p.d. and f orbitals.

4. Electronic Theory of Valency :

Causes of electron redistribution between atoms, octet rule; electrovalent, covalent and co-ordinate bonds. Characteristics of electro-valent, covalent and co-ordinate compounds, electron-dot formulae of some ionic, covalent and co-ordinate compounds.

5. Oxidation and Reduction :

Concept of oxidation and reduction in the light of electron change, balancing of redox equations by oxidation number method, tests for oxidizing and reducing agents.

4. Periodic Table :

Mendeleef's periodic law, Mendeleef's periodic table, advantages of periodic classification of elements, some anamolies, modern periodic law, the long form of periodic table, and its chief features, types of elements, concept of ionisation potential, electronic affinity, electronegativity, and atomic radii, and their variation across the periods and down the groups in the periodic table.

7. Acids, Bases and Salts :

The ionic theory, characteristics of acids, bases and salts, nomenclature of compounds, strong acids and weak acids, strong bases and weak bases, neutra-lization, precipitation and hydrolysis.

8. The Gaseous State of Matter :

Boyle's law, Charle's law and combined gas equation, Graham's law of diffusion, and related problems.

9. The Liquid State of Matter :

Properties of liquids, solutions, solubility and solubility curves.

10. The Solid State of Matter :

Ionic solids (Nacl lattice), covalent solids (diamond and graphite) vander-waal's forces, metallic bond.

CHEMISTRY - II
EG 417 CHE

Lecture : 3
Tutorial : 1

Year : I
Part : A (Technician Intake)

1. Avogadro's Hypothesis :

Avogadro's hypothesis and Avogadro's number important deductions of Avogadro's hypothesis, mole concept, and related problems.

2. Equivalent Weight, Atomic Weight and Molecular Weights :

Determination of equivalent weight (by hydrogen - displacement method and oxide method), determination of atomic weights (based on Dulong and Petit's rule and equivalent weight), determination of molecular weight (Victor Moyer's method only), related problems.

3. Chemical Equillibrium :

Reversible reactions, law of mass action and concept of dynamic equillibrium and equillibrium constant, Le-chatelier's principle.

4. Electro-Chemistry :

Electrolytes and non-electrolytes, Faraday's laws of electrolysis, solubility product principle and common ion effect.

5. Acidimetry and Alkalimetry :

Equivalent weights of acids, bases and salts, normal and molar solutions, PH and pH scale, titration of

(a) weak acids and strong bases
(b) strong acids and strong bases
(c) strong acids and weak bases
(d) weak acids and weak bases and pH changes at the equivalence points, indicators and their ranges, normality equation, and related problems.

6. Catalysis :

Catalysis and Catalysis, types of catalysis, criteria of catalysis, poisons and promoters.

Non-metals and Compounds :

1. Hydrogen :

Occurrence, laboratory method of preparation, important properties and uses.

2. Oxygen :

Occurrence, laboratory method of preparation, properties and uses.

3. Water :

Water as a natural resource, origin of impurities in water, hard water and soft water, removal of hardness of water, brief outline of treatment of water supplies for domestic and industrial purposes. filtration, flocculation, chlorination.

4. Nitrogen and Its Compounds :

Nitrogen :- Occurrence laboratory method of preparation, importants properties and uses.

Ammonia and Nitric Acid :- Manufacture, properties and uses, nitrogen cycle, and importance of fertilizers.

5. Sulphur and Its Compounds :

Occurrence of sulphur, allotropy, allotropic forms of sulphur, laboratory method of preparation of hydrogen sulphide, its important properties and uses.

Sulphuric Acid :- Manufacture by contact process, importants properties and uses.

6. Halogens and Halogen Acids :

General method of preparation of halogens (Cl_2, Br_2, & I_2) in the laboratory, their important properties and uses.

Hydrochloric Acid :- Preparation in the laboratory, importants properties and uses.

CHEMISTRY PRACTICAL - I
EB 419 CHE

Time : 2 hrs./wk.

Year : I
Part : A (Technician Intake)

List of Experiments :

1. To separate sand in pure state from the given mixture of sand and common salt.
2. To test for cl- and So-ions in the given sample of impure water and to submit some specimen of pure distilled water.
3. To perform some precipitation reactions to represent them in balanced chemical equations.
4. To test for fe++ (ous) ion in the given sample of ferrous sulphate, to oxidize a portion of it to the fe+++(ic) state and to test for fe+++(ic) ion in the sample prepared.
5. To determine the solubility of common salt ion at room temnperature.
6. To fit up an apparatus for the preparation of hydrogen gas, and to study its properties.
7. To fit up an apparatus for the preparation of HCl gas, and to study its properties.
8. To investigate the decompcsition of water by electrolysis using Hogmann's apparatus.
9. To determine the equivalent weight of the given metal by hydrogen displacement method.
10. To investigate the softening of temporary and permanent hard water.
11. To prepare an primary standard solution of sodium carbonate, and to use it to standardise approximately decinormal solution of an acid.
12. To standardise the bench acid solution with the help of a standard alkali solution.
13. To determine the percentage of pure CaCo3 in the given sample of limestone (marble).
14. To study the acid - base neutralization reaction with the help of a pH-meter.

CHEMISTRY - III
EB 456 CHE

Lecture : 2
Tutorial : 2
Lab : 2

Year : I
Part : B (Technician Intake)

METALS :

1. General Metallurgy :

Occurrence of metals, concentration of ores, general methods of extraction, general studies of chlorides, sulphates, nitrates and carbonates of metals.

2. Sodium and Potassium :

Characteristics of alkali metals, extraction of sodium (Down's process) properties and uses of sodium and potassium.

3. Compounds of Calcium :

Oxide, hydroxide and carbonate (marble and limestones), gypsum, plaster of paris, cement, (types and manufacture), chemical constituents of cement, hydration and setting reactions, cement additives, their chemical role and effect.

4. Aluminium :

Occurrence, extraction (outline only), properties and uses, alloys, surface treatment (anodizing).

5. Copper :

Occurrence, extraction (outline only), properties, alloys and uses.

6. Zinc :

Occurrence, and extraction (outline only), properties and uses, alloys, galvanisation.

7. Tin and Lead :

Occurrence and extraction (outline only), properties, alloys and uses. Toxicity of lead.

8. Iron :

Occurrence, extraction (outline only), manufacture of steel (outline only), types of steel, alloys, rusting of iron and its prevention.

ORGANIC CHEMISTRY :

1. Historical development, classification of organic compound, purification of organic compounds, empirical, molecular and structural formulae, functionel groups, homology in organic compounds, isomerism (structural).

2. Aliphatic Compounds :

Saturated and unsaturated hydrocar (methane, ethulene and acetylene). Outline of their preparation in the lab, and important properties and uses. Outline of preparation, properties and uses of primary alcohols, other, aldehydes and ketones, (carboxyllic acids and primary amines).

3. Aromatic Compounds :

Cool tar distillation, preparation, properties and uses of benzene, derivatives of benzene, brief outline of preparation, properties and uses of nitro-benzene, aniline and phenol.

4. Plastics and Polymers :

Outline of preparation, properties and uses of the more common types of thermoplastic and thermosetting polymers. Some common ion exchange resins and their uses (for deionisation of water). Surface coatings, sealants and adhesives.

Practical Works :

1. To detect the acid radical of the given salt (Co_3^{--}, So_3^{--}, S^{--}, and No_2^{--} by dry ways.

2. To detect the acid radical of the given salt (cl^{--}, Br^{--}, I, and No_2^{--}) by dry ways.

3. To detect the acid radical of the given salt (Cl^{--}, Br^{--}, I, So_4^{--}, and No_3^{--}) by wet ways.

4. To detect the basic radical of the given salt by wet ways.

5. Complete analysis of two simple salts.

6. To determine the percentage of water of crystallisation in the given sample of hydrated salt.

7. To detect the elements (N, S and halogens) in the given organic compound.

N.B. :- Basic radicals to be included are Cu^{++}, Pb^{++}, Fe^{++}, Fe^{+++}, Al^{+++}, zn^{++}, Ni^{++}, Ca^{++}, Mg^{++}.

CHEMISTRY IV
EG 512 CHEM

Lecture : 2
Tutorial : 2
Practical : 2/2

Year : II
Part : A

PHYSICAL CHEMISTRY

1.0 Automic Structure :

1.1 Bohr's theory and its limitations

1.2 Heisenberg's uncertainty principle, wave particle duality, wave mechanical model of atom (qualitative concept only)

1.3 Quantum numbers, shapes of s,p,d orbitals, quantum designation of electrons in the orbitals.

2.0 Chemical Bonding :

2.1 Limitations of electronic theory of valency

2.2 Covalent bond (brief treatment with valency bond theory and Molecular orbital theory)

2.3 Hybridisation involving s, p and d orbitals.

3.0 Electro-Chemistry :

3.1 Specific and equivalent conductances, ionic theory, degree of ionisation, variation of conductances with dilution.

3.2 Ostwald's dilution law, pH and buffer solution

3.3 Stangard electrode potentials and electro-chemical series, Nernst equation

3.4 Reversible cells and sign convention, calculation of EMF of cells

3.5 Electro chemical corrosion of metals and its prevention.

INORGANIC CHEMISTRY

4.0 Coordination Theory :

4.1 Werner's coordination theory

4.2 Nomenclature of complexes

Year ; II
Part ; A

wave particle
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itals, quantum
tals.

alency

alency bond

itals.

onic theory,
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3 Simple treatment with valency bond theory

and P Block Elements :

.1 General characteristics and gradation in properties of S and P block elements of periodic table.

ransition Metals :

.1 Characteristic properties of transition metals including electron configuration, variable valency, complex formation, magnetic properties and colour.

Silicones and Silicates :

7.1 Structure of some silicones and silicates.

ORGANIC CHEMISTRY

nomenclature and Isomerism :

8.1 Nomenclature and isomerism of organic compounds, IUPAC system.

Electronic Effects :

9.1 Inductive effect

9.2 Conjugation

9.3 Hyper conjugation

9.4 Resonance

.0 Mechanisms of Reactions :

10.1 Reactive intermediates in organic reaction, carbonium, carbanions and free radicals

10.2 Brief study of some elimination (E_1 and E_2) and substitution (SN_1 and SN_2) reactions

.0 Polymerisations and Polymers :

11.1 Addition reactions to C = C bond

11.2 Some examples of electrophilic, free radical and addition polymerisations

11.3 Thermoplastics and thermosetting resins

11.4 Use of polythene, polypropylene, PVC, Bakelite, polystyrene and fluoro carbons.

List of Experiments in Chemistry for II Year B.E. Civil :

1. To determine the alkalinity of the given sample of water.

2. To determine the hardness of water sample by complexometric.

3. To determine the pH of different aqueous solutions using universal indicator and pH meter.

4. To determine the amount of free chlorine in the given sample of water.

5. To analyse the given sample of ordinary portland cement (SiO_2 by Gravimetric method and calcium by Volumetric method).

6. To determine the viscosity of a liquid by Ostwald Viscometer.

References :

1. Essentials of Physical Chemistry
- B. S. Bahl and G. D. Tuli

2. Advanced Inorganic Chemistry
- Satya Prakash, Tuli, Basu and Madan

3. Advanced Organic Chemistry
- Bahl and Bahl

4. Chemistry of Engineering Material
- C. V. Agrawals

5. Chemistry for Engineering and Applied Sciences
- Steedman, Snadden and Anderson (pergamon)

6. Mechanism of Organic Reactions
- Peter Sykes (Orient Longman)

7. General Chemistry
- C N R Rao, Mac Millan Book Co.

8. University Chemistry
- B H Mahan, India Book Co.

MATHEMATICS - I
EB 412 MTH

Lecture : 3
Tutorial : 2

Year : I
Part : A (Technician Intake)

1. Basic Mathematics :

Set, set membership, notation and specification of finite and infinite sets, subsets, universal set, equality of sets, disjoints sets complement and difference, venn diagram, union and intersection of sets, the real number system, the number line, inequalities, intervals in a real line, absolute values, ordered pairs, cartesian product, relation, its domain and range.

Function, domain and range, inverse function, composite functions, different classes of functions and their graphs, viz.,

(a) Algebraic function : polynomial functions, linear, quadratic and cubic functions.

(b) Trigonometric functions : angle, its measurement in sexagesimal and radian systems, trigonometric function for angles in standard position, trigonometric functions of standard angles.

(c) Exponential functions : the number e, the series ex, the function ax as general exponential function.

(d) Logarithmic functions : logarithmic function as an inverse exponential function, base, notation of a logarithmic function, natural logarithum, basic properties of logarithms.

Sequences as a function, the series, finite and infinite sequences and series, the sign notation, arithmetic sequence and series.

Common difference, the first term, the nth term, sum of the first n terms, geometric sequence and series, common ratio, the general term, the sum of n terms, infinite geometric series (without covergence).

Definition and example of harmonic sequence and series, the means and relation between them. Sum of the squares and cubes of natural numbers.

Permutation, the counting Principle, Permutation with and without repititions, circular arrangement, combination of different things taken any number at a time c (n,r), C (n,r) + C (n,r - 1) = C (n + 1, r), the Binomial theorem

for a positive integral index, Binomial theorem for any index (without proof), Binomial coefficients (Pascal's triangle), general term, the term independent of x, application to approximations.

Probability, favourable and possible cases, complementary events, disjunction and conjunction of events.

2. Trigonometry :

Trigonometric functions of any angle, elementary trigonometric identities (pythogorean), trigonometric functions of negative angles, addition and suostraction formula, complementary and supplementary function, identities, multiple and submultiple angles transformation formula, conditional identities.

Trigonometric functions in terms of sides of a triangle, the sine law, the cosine law, the tangent rule, circum-circle and circum-radius area of triangle in terms of sides of a triangle, the in-radius and ex-radius, trigonometric equations and their solutions in a given interval, inverse trigonometric functions and relations among them.

MATHEMATICS - II
EE 413 MTH

Lecture : 3
Tutorial : 2

Year : I
Part : A (Technician Intake)

1. Differential Calculus :

Idea of limit of a sequence, limit of a function - geometric visualisation, notations for the limit, indeterminate forms, limit theorems without proofs. Proof of

$$\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$$

for integral values of n only, its generalisation without proof, $\lim_{x \to 0} \frac{\sin x}{x}$, computation of limiting values of

algebraic, trigonometric, exponential and logarithmic functions.

Idea of continuity, definition and graphical visualisations. Left and right hand limits, idea of discontinuity, simple examples for continuity testing.

Functions, increments, slope, tangent line, derivative as a limit; notation, basic derivative formulas from definition, derivatives of sum, difference, product and quotient of functions, the chain rule, derivatives of algebraic, trigonometric, exponential and logarithmic functions, implicit and explicit functions, implicit differentiation, logarithmic differentation, second derivatives, relative rates, maxima and minima, rates of changes.

2. Integral Calculus :

Notion of an integral of a function, non-uniqueness of an integral (anti-derivative). Basic rules for integration, the substitutions, principle integration of algebraic, trigonometric, exponential and logarithmic functions. Integration by parts. Definite integrals. Evaluation of definite integrals. Definite integral as the limit of a sum. Use of definite integration for finding the areas under simple curves.

MATHEMATICS - III
EG 452 MTH

Lecture : 3
Tutorial : 2

Year : I
Part : B (Technician Intake)

1. Elementary Vector Algebra :

Scalars and vectors, notation and graphical representation of a vector, modulus of a vector, different types of vectors, angle between vectors, vector addition, subtraction and scalar multiplication, associative commutative and distributive laws for the above.

Two dimensional vectors, coplaner and non-coplaner vectors, three dimensional vectors or vectors in space, components and coordinates of a 2-D vector and 3-D vector, the unit vectors i,j,k, linear combination of vectors, linear dependence of vectors.

Solar product and its geometrical interpretation, rule of sign, condition of perpendicularity, angle between two vectors, length of a vector, i,j,k, and their scalar products, commutative and distributive laws. A vector in terms of three given non-coplaner vectors applications, vector product and its geometrical interpretation, rule of signs, non-commutativity, distributive law (without proof), vector products of i,j,k, vector product in terms of their components. Angle between the vectors, applications (to geometry, trigonometry).

2. Algebra :

Polynomial, term, degree coefficients, absolute term, synthetic division, zero of a polynomial equation (root), linear, quadratic, cubic and biquadratic equation, remainder theorem, factor theorem, fundamental theorem of algebra (without proof), theorem on the number of roots, roots of a quadratic equation, two and only two roots, real and comolex roots, irrational roots, repeated roots, relations between roots and coefficients, conjugate roots.

Complex number; equality, sum, quotient, conjugate, product of complex number, the absolute value, the definitions (a, b) and a + ib, sq. roots of complex number.

Representation of a complex number (Argand Diagram), polar and rectangular coordinates, trigonometric representation of complex number, polar representation of complex numbers, multiplication and division of complex numbers using polar forms; De Moivres theorem (proof of positive integral

power only), application to the solution of equations of type $z^n = a$. Cube roots of unity and their properties.

Simultaneous linear equations in two variables, idea of a matrix, square matrix, elements, rows, columns, row-equivalent matrix method of solving systems of linear equations in two and three variables, idea of a determinant, expansions of a determinant, expansion by sarris rule for 3rd order determination. Cramer's rule for solving simultaneous linear equations in 2 or 3 variables.

Linear inequality in one variable, half lines, linear inequalities in two variables, half planes (open & closed), solution set for a system of linear inequalities, non-intersecting and coincident graphs, vertex, boundary lines, convex polygonal region, maximum and minimum values of a linear expression (linear programming).

MATHEMATICS - IV
EG 453 MTH

Lecture : 3
Tutorial : 2

Year : I
Part : B (Technician Intake)

1. Analytic Geometry of two Dimensions :

Rectangular coordinates, distance formula, section formula, area of a triangle, locus and its equation.

The straight line, three particular standard forms $x = a$, $y = a$, $y = mx$ three general standard forms (slope, intercept and perpendicular forms). Equation of first degree, and its reduction to the standard forms, point-slope form, two point form, distance form, angle between two lines, condition for perpendicularity and parallelism, intersection of straight lines, concurrency of lines, any line through the intersection of two lines, length of perpendicular from a point on line, bisector of angles between lines.

Equation of a pair of straight lines, homogeneous equation of second degree, angle between the lines

$$ax^2 + 2hxy + by^2 = 0,$$

bisectors of the angles between them. General equation of second degree and condition that it may represent a line pair, lines through the origin and the intersection of a given line and a curve.

The circle, definition and equation of a circle in the standard form, general equation of a circle, condition for circle, diameter form, intercepts on the axes by a circle, tangents and normals, equations of tangent and normal including - m form, a point and a circle, a line and a circle, conditions of tangency, length of the intercept, tangents from a point to given circle, length of tangent, pole, polar and chord of contact.

The parabola, definition of a conic section, definition of parabola, the equation

$$y^2 = 4ax,$$

different forms of parabola (introduction only) the equation

$$(y - k)^2 = 4a(x - h),$$

equations of tangents and normal to the parabola $y^2 = 4ax$ including the m - form, parabola and a line condition of

Coordinates in space definitions (origin, axes, coordinate plane, coordinates of a point, octants), change of origin, distance of a point from the origin, distance between two points in space, section formula, midpoint formula, direction cosines and direction ratios, direction cosines of a line joining two points, projections of a point on a line, of a segment of a line on another line, of a broken line in a given line, angle between two lines (angle with direction ratios, conditions for perpendicularity and parallelism).

MATHEMATICS V
EE 513 MATH

Lecture : 4
Tutorial : 2

Year : II
Part : A

1.0 Two Dimensional Analytical Geometry :

- 1.1 System of circles
- 1.2 Radical axis
- 1.3 Coaxial circles
- 1.4 Limiting points
- 1.5 General equation of a conic
- 1.6 Reduction to standard forms

2.0 Differential Calculus :

- 2.1 Limit
- 2.2 Continuity
- 2.3 Differentiability
- 2.4 Differentiation
- 2.5 Successive differentiation
- 2.6 Leibnitz' Theorem
- 2.7 Taylor and Maclaurin expansions
- 2.8 Mean value theorems
- 2.9 Indeterminate forms
- 2.10 Maxima and Minima of function of single variable
- 2.11 Tangent and normals
- 2.12 Curvature
- 2.13 Asymptotes
- 2.14 Curve tracing

3.0 Integration :

3.1 Standard integrals

3.2 Integration of rational irrational and transcendental functions

3.3 Use of partial fractions

3.4 Reduction formulas

3.5 Definite integral

3.6 Definite integral as a sum

3.7 Application to areas, lengths

3.8 Volume and surface of revolution

4.0 Differential equations of first order and first degree and higher degree.

References :

1. Coordinate Geometry
- Lalji Prasad - G P

2. Differential Calculus
- S Narayan - S. Chand

3. Integral Calculus

- S Narayan - S. Chand

4. Differential Equations
- J Ayree - Mcgraw Hill

5. Differential and Integral Calculus
- Piskunov (MIR)

6. Advanced Engineering Math
- E Kreyszig - Wiley Eastern

7. Differential Equations with Applications
- George F. Simmons

MATHEMATICS VI
EG 552 MATH

Lecture : 4
Tutorial : 2

Year : II
Part : B

1.0 1.1 Determinants and their properties

1.2 Addition and multiplication of determinants

1.3 Applications to solutions of simultaneous linear equations

2.0 2.1 Matrix and matrix operations

2.2 Types of matrices

2.3 Transpose, adjoint, inverse of a matrix

2.4 Linear dependence

2.5 Rank

2.6 Applications to system of linear equations

2.7 Linear transformations

2.8 Orthogonal, unitary, Hermitian matrices

2.9 Eigen values and Eigen vectors

3.0 Differential Calculus :

3.1 Partial differentiation

3.2 Euler's theorem

3.3 Tangent plane and normal to a surface

3.4 Differential of a function

3.5 Total differentials

3.6 Change of variable

3.7 Jacobians

3.8 Maxima and minima of functions of two or more variables

3.9 The method of Lagrange's multipliers

4.0 4.1 Double and triple integrals

4.2 change of order of integration

4.3 Change of variables

4.4 Areas, volumes, centroids, moments of inertia using double and triple integrals

4.5 - and - functions

4.6 Dirichlet integrals

References :

1. Differential Calculus - S Narayan

2. Integral Calculus - S Narayan

3. A Text Book of Higher Algebra - Chandrika Prasad

4. Differential and Integral Calculus - Piskunov (MIR)

5. Advanced Engineering Math - E Kreyszig

MATHEMATICS VII
EG 616 MATH

Lecture : 4
Tutorial : 2

Year : III
Part : A

1.0 Analytical Geometry of Three Dimensions :

1.1 Equations of a straight line and plane.

1.2 Shortest distance between two lines.

1.3 Intersection of a line with a plane.

1.4 Intersection of two and three planes.

1.5. Equation of a sphere.

1.6 Plane section of a sphere.

1.7 Standard equations of cones, cylinders, central conicoids and paraboloids.

2.0 Vector Analysis :

2.1 Triple products of vectors and their geometrical meanings.

2.2 Differentiation of a variable vector.

2.3 Scalar and vector fields.

2.4 Gradient of a scalar field.

2.5 Divergence and curl of vector fields.

2.6 Physical meaning of grad., curl and divergence.

2.7 Differential operators and identities.

2.8 Line and surface integrals.

2.9 The Gauss theorem.

2.10 Stoke's theorem.

2.11 Green's theorem.

2.12 Applications.

3.0 3.1 Differential equations of second order.

3.2 Linear differential equations with constant coefficients.

3.3 Euler - Cauchy equation.

3.4 Applications.

4.0 Statistics :

4.1 Frequency distribution.

4.2 Measures of central tendency.

4.3 Measures of dispersion and skewness.

4.4 Moments.

4.5 Binomial and poisson distributions.

4.6 Curve fitting.

4.7 Correlation and Regression.

REFERENCES :

1. Differential Equations - J. Ayres.

2. Vector Analysis - J. Ayres.

3. Text Book of Vector Calculus with Applications - S. Narayan.

4. Elementary Statistics - H. C. Saxena.

5. Analytical Solid Geometry - S. Narayan.

6. Differential Equations with Applications - George F. Simmons.

DRAWING, ESTIMATING & CONSTRUCTION COURSES

Courses in Engineering Drawing

The courses in Engineering Drawing aim at acquiring appropriate skills in the use of the graphic language, necessary for engineering subjects.

The Engineering Drawing I course to be studical by science intake students in Part A of I year and contains matters pertaining to descriptive geometry and fundamentals of drawing. It is expected that at the end of this semester (Part A), the students acquire sufficient skill in drafting and ability in spatial visualization of simple objects.

The objective of the course Engineering Drawing II offered in Part B of I year and common to both intakes is to impart with knowledge and skill in machine drawings and to build a base for working drawings.

Courses in Engineering Materials

The objective of the course is to make the students able to select the proper materials and use it in the construction suitably. With this purpose, the course is framed so as to impart to the students the knowledge of materials properties and required tests and skills in selection of the materials.

The course is designed for science intake and will be studied in Part A of I year.

Courses in Workshop Practice

The aim of the course is to impart to the science intake students the knowledge of practical handling of tools with quality and safety consciousness. The elementary abilities will be developed in carpentry after the completion of Workshop I in Part A of I year. In Part B of I year, the students will have a basic abilities and knowledge about metal and plumbing works in Workshop II.

Courses in Estimating

The course in Estimating offered in Part B of I year for science intake students has an aim to impart the knowledge in quantity surveying and costing. The students will learn in this course the procedures and methods of estimating along with rates and specifications of civil works.

Courses in Building Technology

he aim of the courses is to prepare the students to know the omponents of a building and to have a fair knowledge of echnology to be used in construction of it.

he course 'Building Construction' is framed so as to impart to he science intake students in I year the fundamental knowledge f components and details of a building and a skill in sketching he necessary details. Another course 'Advanced Building chnology' is offered in Part B, III year with an objective to ake the students know and use the technologies adopted in onstruction practice.

Courses in Management

ter the completion of the course Management I and II the tudents are expected,

to use networking techniques in construction project,

to be familiarised with Construction Equipment and Methods,

to be familiar with Construction Tender & Specification,

to have concept of Economics and its use in Construction Projects,

to have concept of Personnel Management such as Organising, Motivating & Directing, Staffing etc.

ENGINEERING DRAWING.- I
EG 420 CE

Lecture : 1
Drawing : 4

Year : I
Part : A (Science Intake)

1. Scales and Dimensions :

   - Uses of different scales on MKS and FPS system.
     Standard sizes of drawing.

2. Lettering :

   - Nepali and English lettering.

3. Plane Geometry :

   - Points, Lines, Angle, Slopes, Circles, Polygons and other plane figures.

4. Solid Geometry :

   - Prisms, Cylinders, Cubes, Pyramids, Spheres and Cones.

5. Orthographic Projections :

   - Points, Lines.
   - Three planes of projections.
   - Relative positions of two lines.
   - Determination of the true length of line.
   - Projections of cubes, cylinders, cones, and pyramids.

6. Isometric Projections :

   - Isometric of planes.
   - Isometric projection of simple solids.

7. Projection of Planes :

   - Traces of planes for different angle of inclination.
   - Angle between a line and a plane.
   - Point of intersection.
   - Intersection of two planes.

8. Projection of Solids :

   - Projection of simple solids when placed under different positions.
   - A solid cut by a plane.
   - Intersection of straight line with a curved surface.

9. Development of Surfaces :

- Simple solids.
- Solids cut by a plane.

Practical Drawing :

1. Lettering, dimensioning and scales.
2. Linework, hatching and two dimensional planes.
3. Different geometrical planes, solid figures and construction of noncircular curves.
4. Points and lines in different planes of projection.
5. Projection of two lines, their relative positions, parallel lines, intersecting and non-intersecting lines.
6. Projection of plane figures.
7. Projectrion of planes in different positions.
8. Projection of simple solids in differert positions.
9. Sections, Developments and Intersection of surfaces and Interpretation.
10. Isometric projection of simple solids.

ENGINEERING DRAWING - II
ES 457 CE

Lecture : 1 Year : I
Drawing : 4 Part : B (Common)

1. Views, Sectional Views and Sections in Machine Drawings :

   (1) Views - normal and edge views
   (2) Simple sectional views
   (3) Broken out sections
   (4) Complex sectional views
   (5) Revolved sections
   (6) Removed sections.

2. Screw Threads, Fasteners, Keys, Rivets and Springs :

   (1) Helical surface and threads, constructing helical & helical surfaces threads and thread symbols in drawings bolted joins, studded joints, screw fastenings.

   (2) Separable and permanent joints cutter joints, keyed joints, spliced joints, down pin joints, riveted joints.

   (3) Springs : kinds of springs, spring symbols, working drawing of springs.

3. Welded Joints :

   Representation of welded joints on drawings.

4. Sketches and Working Drawings or Machine Elements :

   Technical sketching
   general information on working drawings.

5. Working Drawings :

   Reading assembly drawings and detail drawings
   Making detail drawings
   Example of making a detail drawing from an assembly drawing
   Making assembly drawings.

ENGINEERING MATERIALS
EG 421 CE

Lecture : 3
Practical: 2

Year : I
Part : A (Science Intake)

1. Physical Properties of Meterials :

Density, bulk density, porosity, moisture content, water absorption, conductivity, permeability, resistance to weathering, frost and fire, durability etc.

Mechanical Properties of Materials :

Strength, hardness abrasion, wear, elasticity and plasticity etc.

2. Rocks :

Formation and classification of rocks --- igneous, sedimentary and metamorphic rocks and their properties, types of stones for engineering purposes, scope of use.

3. Bricks :

Types of bricks - sun baked, burnt, locally manufacture (hand cut) and machine made bricks, constituents of bricks, physical and mechanical properties of clay bricks, manufactures of bricks, use of bricks, ceramic tiles - types and uses.

4. Lime and Lime Mortar :

Types of lime, use of lime, manufacture of lime, slaking and other properties of lime mortar with lime and other materials, preparation and use of lime mortar. Lime concrete - constituents, properties and uses.

5. Cement and Cement Mortar :

Types of cement, constituents of ordinary portland cement, manufacture process of ordinary portland cement, field tests and laboratory tests of cement, storage of cement, different types of cement mortar, properties of cement and mortars --- setting time, soundness, tensile and compressive strength etc., use of cement mortars.

6. Cement Concrete :

Constituent materials - cement, aggregate, water, admixtures, properties of fresh concrete - workability, measurement of workability, factors affecting workability, stability.

Properties of hardened concrete - strength, factors influencing strength, deformation, durability, shrinkage. Mixing, transportation, pouring and curing of concrete.

7. Timber :

Sources of timber, growth, structure, tree classification, conversion of timber, characteristics of timber - strength, moisture content, timber infectation.

Defects of timber- natural, chemical, conversion and seasoning defects.

Preservation of timber.

Uses of timber - structural carpentry, falsework carpentry, finishing joinery.

Types and uses of timber.

Introduction to plywoods and laminated boards.

8. Metals :

Introduction to metals and alloys used in engineering, ferrous and non-ferrous metals, iron and steel - types, properties and use.

9. Other materials :

Introduction to other materials of construction - paints and varnishes, asphalts and bitumen, asbestos, glass, pipes and etc.

Practical :

1. Tests on brick.
2. Physical properties of cement (fineness, soundness).
3. Compressive strength of cement.
4. Bulking of sand.
5. Crushing strength of concrete cubes.
6. Workability of fresh concrete.
7. Moisture content of timber.

WORKSHOP - I
EB 424 CE

Lecture : 1
Practical : 4

Year : I
Part : A (Science Intake)

1. Safe and correct use of basic hand tools such as jack plane, try square marking gauge, chisels, saws and hand drills.

2. Preparing a piece of wood to the correct shape and size.

3. Project :

Each student has to make at least two items from the following jobs :

(a) Paper tray
(b) Small book rack
(c) Bench hook
(d) Money box
(e) Pair of sighting sticks.

WORKSHOP - II
EG 462 CE

Lecture : 1
Practical : 4

Year : I
Part : B (Science Intake)

1. Introduction :

   (a) Workshop and safety.
   (b) Measuring and making processes and techniques.
   (c) Introduction and uses of basic hand tools.

2. Making a small metal project.

3. Introduction and uses of basic sheet metal tools (folding, rivetting etc.) and making a small sheet metal project (box, funnel, pipe clam etc.).

4. Introduction and uses smithy tools and making a small project.

5. Introduction and uses of plumbing hand tools.

6. Measurement methods of G.I. pipe and the processes of cutting, threading etc.

7. Making a small pipe measurement project, using various types of G.I. fittings.

ESTIMATING
EG 459 CE

Lecture : 2
Practical : 4

Year : I
Part : B (Science Intake)

1. Procedure of Estimating :

   Introduction, system of units, method of estimating, main items of work, unit of measurements and payments for various items of work and materials.

2. Different Kinds of Estimates :

   Approximate estimate; detailed estimate; revised estimate; supplementary estimate; complete estimate.

3. Preparation of Detailed Estimate :

   Cost of items; contingency; work charged establishment.

4. Subhead of Estimate :

   Earthwork, plain concrete, R.C.C. concrete, form work, steel, flooring, woodwork, steelwork, plastering or pointing, finishing (white washing, colour washing, painting etc.), water supply and sanitary works, miscellaneous.

5. Different Methods for Estimating :

   Centre line method; long and short wall method; (crossing method).

6. Analysis of Rates :

   Analysis of rates of building works, analysis of rates of sanitary and water-supply works, analysis of rates of road work.

7. Detailed Estimate :

   Estimate of walls; estimate of a single room building; estimate of a two roomed building; R.C.C. slab; beam; column footing; staircase, estimation of earthwork by three methods; R.C.C. slab culvert; R.C.C. T-beam decking; septic tank; soak pit.

8. Specifications :

   General and detailed specifications of building and road works.

BUILDING CONSTRUCTION
EB 423 CE

Lecture : 2
Practical : 4

Year : I
Part : B (Science Intake)

1. Introduction :

Defination of Building Construction ; the importance of the study of building construction ; the introduction to common building materials ; the combination of building materials to form the main building elements ; the combination of building elements to form the main parts of the building.

2. Types of building structures :

(a) Load-bearing :

Materials used, appropriateness, efficiency & economyc consideration.

(b) Framed Construction :

The main elements of framed construction ; space efficiency and appropriateness of framed construction ; the choice of materials (R.C.C , steel) for different types of framed construction.

(c) Comparative advantages of the above two types :

3. Types of loads in a building :

(a) Dead loads :

General discription ; distribution and general magnitude of dead load in residential buildings.

(b) Live loads :

Various elements contributing to live load ; accepted live loads in residential buildings.

(c) Other Loads :

Wind load, seismic load, snow load, load due to impact and vibration - their general discription.

4. Soils :

General clasifications, general discription of top soil and sub-soil with respect to foundation design ; bearing capacities of various kinds of soil.

5. Foundations :

(a) Spread foundation :

countinuous strip, independent footing, combined footing.

(b) Raft Foundation :

When used ; the different types - ordinary raft (slab only), beam and slab type, cellular raft - advantages and limitations.

(c) Piles :

When used ; the types of piles - end bearing, friction & sheet piles - their appropriateness.

6. Damp-Proofing :

Causes and effects, the neceesity of D.P.C., the minimum height, thickness; the types; their appropriateness; brief explanation on vertical D.P.C.

7. Ground Floors :

(a) Solid :

Typical section, the function and appropriateness of the different layers.

(b) Suspended :

The difference from solid ground floor, construction details along with the functions of the different elements of the suspended floor; plan and section of suspended floor.

8. Walls :

(a) General Wall Types :

Bonding.

(b) Special Wall Types :

Cavity wall; their usage and advantages, curtain walls etc.

9. Doors & Windows :

(a) Doors :

The parts - frame & shutter; the details of a typical

frame; the types of shutters - panelled, flush as well as the older types - ledged, braced & framed.

(b) Windows & Ventilators :

Types of windows & ventilators (side hung, top-hung etc.), details of fixed & operable parts & their depiction in plan as well as section.

10. Upper Timber Floors :

(a) Simple Upper Timber Floors :

When used (in terms of span), the elements, the construction details as well as plans and sections of upper timber floors.

(b) Double Upper Floors :

When used, the elements & construction details.

(c) Tripple Floors :

When used, the main elements & construction details.

(d) Brief Notes :

Timber, trimming & trimmed joins; types of strutting - why used.

11. Staircase :

Elements of staircase, relation between riser & tread, the types of staircases (in terms of design); staircase design given floor to floor height and space allocation.

12. Roofs :

(a) Single Timber Roof :

The types, their comparative advantages, their construction details, when used.

(b) Double & Tripple Roof :

When used, the elements, their construction details.

(c) Introduction to RCC Roof :

(d) Roof Coverings :

Tiles, slates CCT sheets etc.

ADVANCED BUILDING TECHNOLOGY
EB 635 CE

Lecture : 4

Year : III
Part : B

1. Foundations - underpinning insertion of DPC in existing building structures.

2. Basements - retaining properties and waterproofing of basements.

3. Construction Joints - need of provision, treatment/ detailing at roof level, floors and external walls. Expansion joints.

4. Temporary Constructions :

   (a) Scaffoldings - single and double scaffold.

   (b) Timbering of excavations - timbering of trenches.

   (c) Formworks for RCC constructions - design, construction and shipping of formworks. Formworks in timber for RCC column, beam and slab.

   (d) Shoring - use and construction of horizontal shores, raking shores and vertical shores.

5. Cladding and External Finished on Frames Structures - brick facing, cladding in stone, concrete panels use of cramps, ties, etc.

6. (a) Light weight partitions in timber - function and construction connection with structure.

   (b) Suspended ceilings.

7. Building Sciences :

   (a) Moisture - movement through building components and fabric condensation and prediction, vapour banices.

   (b) Thermal aspects - Comfort. Thermal properties of building components and fabric. Thermal resistance, thermal capacity. Capacitative and resistive insulation.

(c) Sound. Acoustical properties of building material. Noise control. Structure borne noise. Constructional precautions to reduce noise. Absorptive and reflective materials.

8. Building Services :

(a) Electricity - general principles, wiring systems, trunkings, busbars, ducts for electrical distribution. Safety precautions.

(b) Water supply/drainage - general principles, mains water supply, storage and distribution. Hot water supply. Waste and soil systems. Rainwater pipes and gutters. Septic tanks.

(c) Lifts and escalators. General principles and practice.

(d) Airconditioning and ventilating systems. General principles and construction standards. Trunking and ducts.

MANAGEMENT I
EG 716 CE

Lecture : 3
Tutorial : 1

Year : IV
Part : A

1.0 Network Techniques :

1.1 Introduction to the network techniques, bar-chart, use of CPM and PERT for planning, scheduling and control of construction works, time-cost trade off, cost analysis, optimum duration.

2.0 Construction Planning :

2.1 Planning for construction, facilities, shops and plants and utilities.

2.2 Preparation of construction schedules for job, materials, equipment, labour and budgets using CPM.

2.3 Planning for construction plant and equipment, factors of selection.

3.0 Familiarisation With Construction Equipments and Methods :

3.1 Earth movement - methods of borrow, handling and placement of earth, equipment for earth construction, and application.

3.2 Concrete - aggregate production, concrete production handling and placement.

3.3 Piles and cassions.

3.4 Tunnel construction and hydraulic construction.

3.5 Highway construction.

4.0 Construction Tender & Specification :

4.1 Specification writing - techniques, use of international and local standards, code of practice, product specification, performance specification.

4.2 Contractual procedure - tendering, elements of contract law, conditions of contract, arbitrations, interim and final bills and payment, contractor's prequalification, postqualification, evaluation and acceptance.

4.3 Construction cost control, construction quality control and inspection, construction safety at work.

References :

1. Construction Planning - Equipment & Methods
- R. L. Peurifoy.

2. Construction Equipment, Planning and Application
- Mahesh Varma.

3. Management by Network Analysis
- Amitabha Bhattacharya & S. K. Sorkhel.

4. Contractor's Management Hand-Book
-James O'Brien.

5. Scheduling Hand-Book
- James O'Brien.

6. Moving the Earth
- Nicholas.

7. Construction Management and Accounts
- V. N. vazirani and S. P. Chandola.

8. Construction Plant: Excavating and Materials Handling Equipments and Methods
-Frank Harris.

9. Critical Path Analysis, A System Approach
- A. V. Srinivasan.

10. Construction Planning and Management through System Techniques
- Mahesh Varma.

MANAGEMENT II
EB 753 CE

Lecture : 4
Tutorial : 1

Year : IV
Part : B

Part A : Economics (Managerial)

1. Introduction :

1.1 Nature and significance of economics, science, engineering and technology, their relationship with economic development.

1.2 Concept of economics to scale, cost curve, real and opportunity cost, evaluation, replacement cost, sinking cost, depreciation.

1.3 Concept of cost benefit analysis.

1.4 Concept of wages, rent, interest, profit, revenue, tax and insurance.

2. Economic Analysis & Capital Investment :

2.1 Search for alternatives, economic decision making, engineering efficiency and financial efficiency.

2.2 Methods of Economic Analysis :

2.2.1 Rate of return - opportunity cost, profit, time-value of money, discounting the future. Productivity of capital, compound rates of return, sinking fund factor, capital recovery factor.

Taxes - use of formulaes and tables, comparing alternative investment policies, examples.

2.2.2 Annual cost computation - comparing alternatives, examples.

2.2.3 Present worth - importance of time period, comparision of alternatives, example.

2.2.4 Break even analysis, examples.

3. Accounting :

3.1 Financial accounting - use of funds, capital and revenue expenditure, acquisition of assets, depreciation, working capital, cash cycle.

3.2 Accounting statements - balance sheet, profit and loss account, profitability, liquidity.

3.3 Cost Accounting :

3.3.1 Cost data - materials, labour, expense, overheads.

3.3.2 Cost ascentainment - activity costing, cost centre, cost unit, cost characteristics.

Part B : Personnel Management

1. Introduction :

1.1 Management principles, administration, principles, organisation principles, terminological differences.

2. Organising :

2.1 Types of organisation, authority delegation.

2.2 Centralization and decentralizing - supervisory and leadership styles, communication, information systems for decision, examples.

3. Motivating & Directing :

3.1 Personal - job evaluation, merit rating, wage and salary structure.

3.2 Safety - unsafe conditions and acts, human element, chance factor, system safety.

3.3 Fault-true analysis.

3.4 Trade unions and relation with management.

4. Staffing :

4.1 Personal selection - placement, personal testing, personal training, examples.

References :

1. Construction Management by Roy Pilcher.

2. Engineering Economy by Thusen & Fatricky.

3. Mathematical Founations of Design - Civil Engineering Systems by Stark & Nicholas.

4. Construction Economic Policy by Douglas.

5. Modern Construction Management by Frank Harris & Ronald McCaffer.

6. Principles of Economics by Vaish & K. K. Dewett.

7. Economic Development Planning by Ghengon.

8. Economic Theory and Operation Analysis by W.G. Baurnol.

9. Introduction to Nepalese Economy by Dr. Badri Prasad.

10. Economic Survey by Ministry of Finance, H.M.G. Nepal.

11. Management, Principles and Practice by McFarland.

STRUCTURAL ENGINEERING COURSES

Courses in Structures

The courses in structures (Engineering Mechanics, Strength of Materials, Structural Mechanics I, II, Design of structures I, II) are aimed at preparing the students to take up, independently, design and construction of a safe and economic structure using up-to-date structural concepts, techniques of structural analysis and selection of suitable materials as well. The emphasis is not on the prescribed courses alone. These courses will try to generate interest so that students take up further reading on their own so that they may pursue deeper understanding in Structural Engineering and follow future development in the field. The courses include methods of structural analysis of most of the conventional structural components and systems, design of reinforced concrete, steel and timber structures and introduction to design of prestressed concrete structure along with the materials and methods of construction. In reinforced concrete design 'Limit State Method' as well as 'Working Stress Method' are incorporated, but the emphasis has been placed on the former.

Experimental assignments in the laboratories are incorporated wherever appropriate to support and augment theoretical concepts in materials behaviour, and structural analysis and design. This will further consolidate the understanding of students in the concerned aspects of the courses and generate interest for research work concerning structures.

These courses will be studied from 2nd year to 4th year. Only the course Mechanics of Structures is framed so as to impart fundamental knowledge in mechanics and strength of materials for science intake students in Part B, I year.

MECHANICS OF STRUCTURE
EG 460 CE

Lecture : 4
Tutorial : 1

Year : I
Part : B (Science Intake)

1. Loads and Forces :

Classification of forces acting on elements of structures, horizontal and vertical loads, the concentrated load, uniformly distributed load, triangular load, couple, static and dynamic load, imposed load, dead load, live load, wind load, seismic load etc.

2. Supports :

Different types of supports, roller support, hinged support, fixed support, their symbolic representation, number and type of reaction in each, determinancy and indeterminancy of a structure, necessity of sufficient number of supports for a stable beam.

3. Beam Reaction :

Determination of beam reactions due to various combination of loads on simply supported beams with overhanges, cantilever beams (loads may be concentrated, uniformly distributed, triangular and couples).

4. Bending Moment and Shear Force :

Definition, nature of bending and shear, sign convention, plotting of BM & SF diagrams, nature of the curves due to different loads, various combination of loads (concentrated, U.D.L., triangular and couples) on simply supported beams with overhang and cantilevers, the relation between types of load, BM & SF diagrams, maximum BM and shear forces and their position, calculating BM from SF diagrams.

5. Centroid of Plane Elements :

Definition, practical concept of C.G., first moment of area, C.G. of regular plane figures (rectangle, triangle, sector), general formula for determination of C.G., axes of symetry, determination of C.G. of built-up plane figures, C.G. of standard steel sections, C.G. of built-up standard steel sections.

6. Moment of Inertia :

Definition, second moment of area, units, polar moment of inertia, determination of moment of inertia of regular plane

sections (rectangle, triangle, circle), parallel axis theorem, M.I. of built-up regular sections, radius of gyration, M.I. of standard and built-up steel sections.

7. Simple Stress and Strain :

Materials under action of external forces, elasticity, plasticity, ductility, brittleness, deformation, permissible stresses, ultimate stresses, factor of safety, stress-strain curve for different material with salient points, elastic limit, Hooke's law, modulus of elasticity, poisson's ration, modulus of rigidity, volumetric strain and its relationship with longitudinal strain, tension and compression in composite bars, stresses due to change in temperature.

8. Flexure Theory :

Coplaner bending, pure bending, assumptions, neutral plane, radius of curvature, flexural formular, flexural stiffness, normal stress, section modulus, simple flexure designs.

9. Simple Plane Trusses :

Geometric stability and static determination of trusses, joint method, section method, Bow's notation, graphical method.

10. Rivetted Connections :

Types of joints, types of failures of joints, strength of rivetted connections, efficiency of a joint.

ENGINEERING MECHANICS
EG 515 CE

Lecture : 3
Tutorial : 1

Year : II
Part : A

1.0 Introduction :

1.1 Engineering Mechanics and its scope.
1.2 Rigid,deformed and fluid bodies.
1.3 Introduction to the concepts of statics and dynamics.
1.4 Concepts of space,force,mass and time.
1.5 Concept of a particle.
1.6 Principles of force.
1.7 Newton's laws of motion and gravitation.
1.8 System of units.

2.0 Introduction to Vector Algebra :

2.1 Vector and scaler quantities.
2.2 Addition and subtraction of vectors.
2.3 Laws of vectors.
2.4 Scaler (dot) product.
2.5 Vector (cross) product.
2.6 Unit vector in cartesian coordinate system & direction cosines.
2.7 Scaler triple product.
2.8 Vector triple product.

3.0 Forces in Particles and Rigid Bodies (General Cases in Space) :

3.1 Characteristics of force.
3.2 Transmissibility and equivalent force.
3.3 Resolution and composition.
3.4 Moment of a force about a point.
3.5 Moment of a force about an axis.
3.6 Varignon's theorum ; couples.
3.7 Resolution of a force into a force and a couple.
3.8 Simplest resultant of a system of forces.

4.0 Equilibrium of Particles and Rigid Bodies (General Cases in Space) :

4.1 External and internal forces.
4.2 Degrees of freedom ; boundary conditions.
4.3 Free body diagram.
4.4 Equations of equilibrium.

5.0 Friction :

5.1 Introduction.
5.2 Laws of friction.

5.3 Static and kinetic friction and their angles an coefficients.

6.0 Centre of Gravity and Centroids :

6.1 Centroid of a group of particles.
6.2 Centroid of lines,planes areas and curved areas.
6.3 Centroid of volumes.
6.4 Centroid of built-up lines, areas and volumes.
6.5 Centre of mass and centre of gravity.
6.6 Centre of force and pressure.

7.0 Motion of a Particle :

7.1 Introduction to dynamics - kinetics and kinematics.
7.2 Introduction to different system of coordinates.
7.3 Rectilinear motion.
7.4 Curvilinear motion - cartesian coordinate system.
7.5 Curvilinear motion - tangential and normal coordinates
7.6 Curvilinear motion - cylindrical and polar coordinates
7.7 Motion of projectiles.
7.8 Relative motion - displacement and velocity.
7.9 Instantaneous centres for plane motion.
7.10 Relative motion.
7.11 Relative motion with respect to rotating and movin axes.

8.0 Motion of a Rigid Body :

8.1 Equation of motion.
8.2 Motion of the mass centre of a system of particles.
8.3 Translation of a rigid body.
8.4 Rotation of a rigid body.
8.5 D'Alembert's principle.
8.6 System of rigid bodies.
8.7 Central forces.
8.8 Gravitational central force.

9.0 Work Energy and Power :

9.1 Work done by a force and system of forces.
9.2 Work energy relation of a particle.
9.3 Potential energy and kinetic energy of a particle and rigid body.
9.4 Principle and conservation of energy.
9.5 Power and efficiency.
9.6 Dissipation of mechanical energy.

10.0 Impulse and Momuntum :

10.1 Linear impulse and momentum and their principle.
10.2 Conservation of linear momentum.
10.3 Elastic impact.
10.4 Angular momentum and its principle and conservation.

REFERENCES :

1. Engineering Mechanics, Static & Dynamics
   - Iruing H. Shames (Prentice Hall of India)

2. Analytical Mechanics for Engineers, Statics & Dynamics
   - Charles L. Best and William G. Mclean
   (International Text Book Company)

3. Engineering Mechanics
   - K. L. Kumar

4. Mechanics for Engineers, Statics & Dynamics
   - Bear & Johnston

STRENGTH OF MATERIALS
EG 554 CE

Lecture : 4
Tutorial : 2
Practical : 2/2

Year : II
Part : B

1.0 Introduction :

1.1 Scope of the subject.
1.2 Definition of strength, stiffness, and stability of load carrying members.
1.3 Simplifying assumptions made in strength calculation concerning material properties, loads, and their interaction.
1.4 Types of structural supports, their schematic representation and support reaction on them.
1.5 Definition of mechanical properties of materials -- elastic, plastic, ductile, brittle, malleable etc.
1.6 Types of structural elements -- bar, plate, block ; and their characteristics.
1.7 Internal forces under the action of different forms of external forces (axial, transverse, twisting etc.).

2.0 Simple Stresses and Strains :

2.1 Definition of stress, strain, Hooke's law for simple axial stress, Modulus of elasticity.
2.2 Force-deformation diagram, stress-strain curve with different prominant points (different materials).
2.3 Factor of safety, basis of its determination and the concept of working stresses.
2.4 Lateral effect of longitudinal stress, lateral strain and poisson's ratio.
2.5 Absolute elongation or contraction.
2.6 Total axial deformation of bars of varing cross-section and tapered section and compound bars.
2.7 Deformation and development of stresses due to change in temperature.
2.8 Shear stess, shear strain and modulus of rigidity ; the concept of pure shear.
2.9 Complementary shear (law of conjugate shearing stress).
2.10 Volumetric strain and Bulk modulus.
2.11 Relation between elastic constants.
2.12 True stress and true strain.

3.0 Stresses on Inclined Sections :

3.1 Definition of stresses acting on an inclined plane.
3.2 Stresses in plane inclined at an angle to the direction of axial stress and derivation of their relationship.
3.3 Stresses in an inclined plane due to two perpendicular stresses and derivation of their relationship.

3.4 Graphical method of finding the resultant stresses on an inclined plane by ellipse of stress method.
3.5 Graphical method of finding the resultant stresses on an inclined plane by Mohr's circle method.
3.6 Stresses on an inclined plane of an element subjected to pure shear and derivation of their relationship.
3.7 Stresses on an inclined plane of an element subjected to normal stresses and shear stresses along two planes at right angles and derivation of their relationship.
3.8 Principal planes, principal stresses and planes of maximum shear and their determination -- analytical and graphical.

4.0 Geometrical Characteristics of Sections :

4.1 Statical moment of an area about an axis and about perpendicular axes.
4.2 Determination of the centroid of an area by area moment method (review).
4.3 Moment of inertia of an area with respect to perpendicular axes.
4.4 Polar moment of inertia about a point.
4.5 Product of inertia.
4.6 Relationship between polar moment of inertia about a point and axial mommets of inertia about two perpendicular axes passing through the point.
4.7 Parallel axis theorum for moment of inertia.
4.8 Moment of inertia about two perpendicular axes rotated through an angle.
4.9 Principal axes of inertia and principal moments of inertia.
4.10 Properties of principal axes of inertia.
4.11 Relationship between products of inertia about two sets of parallel axes.
4.12 Moment of inertia and product of inertia of composite sections.
4.13 Section modulus of a section.
4.14 Radii of gyration of sections about perpendicular axes.

5.0 Bending Moments and Shear Forces :

5.1 Definition of a beam.
5.2 Concept of a beam and different cases of bending -- pure transverse, plane and oblique.
5.3 Determination of beam reaction for different cases
5.4 Application of method of sections and determination of internal forces --shear force,thrust and bending moment.
5.5 Sign convention for axial force, shear force and bending moment.
5.6 Relationship between rate of loading, shear force and bending moment on a beam.
5.7 Shear, thrust and bending moment diagrams for various types of beams with different loading conditions.

5.8 Calculation of maximum shear force and bending moment of overhanging beams with dead and live loads and development of the concept of envelop of maximum shear and bending moment diagrams.

6.0 Bending Stresses in Beams :

6.1 Pure bending and bending stress.
6.2 Basic assumption in the theory of bending.
6.3 Derivation of relation between bending stress and curvature.
6.4 Relationship between bending stress, bending moment and sectin modulus.
6.5 Bending stress distribution across cross-sections of different shapes.
6.6 Design of homogeneous beam sections for pure bending.
6.7 Introduction to transverse bending and shearing stress.
6.8 Relationship between shear stress, vertical shear force and geometrical properties of the section.
6.9 Shear stress distribution across cross-sections of diffrent shapes including derivation of formulae for each case.

7.0 Torsional Stresses :

7.1 Introduction to torque and torsional shearing stress.
7.2 Internal torque (twisting moment) by method of sections and twisting moment diagrams.
7.3 Analysis of torsional stresses in circular sections and their deformations.
7.4 Torsional stresses in non-circular solid sections.
7.5 Shear distribution in hollow sections under the action of torsion.
7.6 Power transmitted by a shaft.

8.0 Shear Centre :

8.1 Bending axis and shear centre.
8.2 Position of shear centre.
8.3 Shear flow.
8.4 Shear centre for channel section.
8.5 Shear centre for tee section.
8.6 Shear centre for I section with unequal flanges.
8.7 Shear centre for angle section.
8.8 Unsymetrical sections.

9.0 Complex Stresses and Deformations :

9.1 The concept of complex stresses and deformations.
9.2 Application of method of sections, internal force diagrams and principle of superposition to determine critical sections.
9.3 Internal force diagrams.

9.4 Introduction to various possible cases of compound stresses.
9.5 Oblique bending (bending in two planes) and their stresses.
9.6 Combination of bending and axial load including oblique and axial load.
9.7 Equation of zero line, core of a cross section and the properties of a core.
9.8 Combination of torsion and shear -- close coil helical springs subjected to axial loads.
9.9 Combination of bending and torsion -- circular shafts and illustration of the state of stress at critical sections.
9.10 Combination of torsion and axial load -- determination of principal stresses.
9.11 Analysis of thin walled vessels under internal pressures ; derivation of Laplace's equation.

10.0 Triaxial State of Stress :

10.1 Introduction.
10.2 Principal stresses and planes.
10.3 Direction of principal planes.
10.4 Mohr's circle for triaxial principal stresses.

11.0 Failure Theories :

11.1 Objective of failure theories.
11.2 Maximum normal stress theory.
11.3 Maximum linear strain theory.
11.4 Maximum shearing strain theory.
11.5 Application of failure theories in combined cases of stresses.

12.0 Theory of Columns :

12.1 Introduction.
12.2 Stability of columns.
12.3 Euler's column formulae for different end conditions.
12.4 Limitations of Euler's formulae.
12.5 The Secant formulae.
12.6 Representation of imperfections by equivalent eccentricity.

LABORATORY :

1. tension test
2. Use of electrical strain gauge
3. Bending of beam
4. Column theory

REFERENCES :

1. Elements of Strength of Materials
   - S. Timoshenks and D H Young
   Van Nostrand Reinhold Co.

2. Strength of Materials and Mechanics of Structures
   - Dr. B C punmia
   Standard Publishers Distributors

3. Mechanics of Solids and Structures
   - P P Benham and F V Warnock
   Pitman Publishing

4. Materials of Structures
   - R Whithow
   Long man

5. Mechanics of Structures Vol.I
   - S B Junnaker and H V Adavi
   Charotar Publishing House

6. Mechanics of Materials
   - Ferdinard P. Beer and E Russel, Johnston, Jr.
   McGraw Hill International Book Company

7. Strength of Materials Vol.I and III
   - Stephen Timoshenko
   Van Nostrand/East West Press

STRUCTURAL MECHANICS - I
EG 611 CE

Year : III
Part : A

Lecture : 4
Tutorial : 2
Practical : 2/2

1.0 Introduction :

1.1 Geometrical stability -- necessary & sufficient conditions.
1.2 Determinancy of structures -- external, internal and overall.
1.3 Numerical and graphical methods of analysing determinate plane trusses.
1.4 Introduction to indeterminate structures.

2.0 Strain Energy :

2.1 Linearly elastic structures.
2.2 Principle of superposition.
2.3 Strain energy and complimentary strain energy.
2.4 Strain energy due to gradually and suddenly applied direct load ; dynamic multipliers.
2.5 Strain energy due to bending, shear and torsion.

3.0 Method of Virtual Work :

3.1 Work and complimentary work.
3.2 Displacement of beams and frames by method of real work.
3.3 Calculation of real work from bending moment, shear force and thrust diagrams.
3.4 Limitations of the method of real work.
3.5 Introduction to the method of virtual work.
3.6 Displacements by the method of virtual work.
3.7 Direct and bending effects.
3.8 Temperature effects, length adjustments and misfits.
3.9 Combination of different effects.
3.10 Stresses and deflections due to impact loadings.

4.0 Deflection of Beams :

4.1 Introduction to curvature, slope and deflection.
4.2 Differential equation of the deflection curve.
4.3 Deflection by method of integration.
4.4 Introduction to Macaulay's method.
4.5 Moment-area method.
4.6 Sinking of supports and temperature effects.
4.7 Deflection by Conjugate beam method.
4.8 Deflection by strain energy method.
4.9 Deflection due to shear.

5.0 Influence Lines :

5.1 Introduction to moving static loads.
5.2 Concept of influence lines.
5.3 Difference between an influence line diagram and a function diagram.
5.4 Influence line diagrams for support reactions.
5.5 Influence line diagrams for bending moments and shear forces.
5.6 Influence line diagrams for forces in members of plane trusses.
5.7 Influence line diagrams in case of indirect load applications (panel loadings) .
5.8 Determination of functions (reaction, bending moment, shear force etc.) from influence line diagrams.
5.9 Loading of influence line diagrams (use of standard load trains).
5.10 Most critical position of a load on a beam span.

6.0 Statically Determinate Arches and Frames :

6.1 Types of arches and frames.
6.2 Three hinged structures with support at same level.
6.3 Determination of forces (support reactions, radial shear,thrust, bending moment etc.) by numerical method.
6.4 Analysis of three hinged arches by Graphical method.
6.5 Influence line diagrams for reactions, bending moments, shear forces and thrusts in three hinged arches and frames.
6.6 Three hinged arches and frames with supports at different levels.

7.0 Suspension Cables :

7.1 Unstiffened cables.
7.2 Theory of suspension structures with unstiffened cables.
7.3 Catenary and parabolic cables.
7.4 General cases of the parabolic cable.
7.5 Elements of a simple suspension bridge.
7.6 Three hinged stiffening girder.
7.7 Stress determination in three hinged stiffening girder.
7.8 Tower structures, wind cables and ties.
7.9 Influence line diagrams.

8.0 Introduction to Space Trusses :

8.1 Equilibrium of concurrent forces in space.
8.2 Tension coefficients.
8.3 Analysis of simple space frames.
8.4 Shear legs, tripods etc.

LABORATORY :

1. Influence lines for beams and girders.

2. Measurement of reactions in three hinged arches under different loading arrangements.

3. Influence lines for plane frames.

4. Deflection of a beam.

REFERENCES :

1. Structural Mechanics
   - A. Darkov and Kuznetsov, Mir Publishers.

2. Structures
   - Marshall & Nelson, Pitman.

3. Structural Analysis
   - S. A. Raj.

STRUCTURAL MECHANICS - II
EG 654 CE

Lecture : 4
Tutorial : 2
Practical : 2/2

Year : III
Part : B

1.0 Statically Indeterminate Structures :

- 1.1 Types of indeterminate structures.
- 1.2 Degree of redundancy ; degree of freedom.
- 1.3 Principle of analysis.
- 1.4 Introduction to different methods of analysis.

2.0 Theorums on Displacements :

- 2.1 Maxwell's reciprocal theorum.
- 2.2 Betti's law.
- 2.3 Castigliano's theorums.

3.0 Deflection of Plane Trusses :

- 3.1 Application of virtual work method (unit load).
- 3.2 Application of Castigliano's theorum

4.0 Method of Consistent Deformation (General Method) :

- 4.1 General principle.
- 4.2 Appropriate choice of redundants.
- 4.3 Compatible equations.
- 4.4 Solution of equations with the help of graphical multiplication method.
- 4.5 Effect of temperature and adjustments.
- 4.6 Application to statically indeterminate beams, pin-jointed and stiff jointed frames.
- 4.7 Application to two hinged parabolic arches with I =ISecθ including yield of supports and temperature effects.

5.0 Slope Deflection Method :

- 5.1 Derivation of slope deflection equation.
- 5.2 Fixed - end effects.
- 5.3 Rotational and translational effects.
- 5.4 Modification to slope deflection equation for fixed-pinned member.
- 5.5 Analysis of continuous beams including settlement of supports.

6.0 Method of Moment Distribution :

- 6.1 Principle of the method.
- 6.2 Fixed-end moments.
- 6.3 Carry-over, stiffness and distribution factors.

6.4 Application to continuous beams with different end conditions.
6.5 Application to frames without side sway and with different end conditions.
6.6 Case of continuous beam with known settlement.
6.7 Symmetry and anti-symmetry cases.
6.8 Frames with side sway ; rotation of joints.
6.9 Final bending moment, shear force and thrust diagrams for continuous beams and frames.

7.0 Influence Lines for Continuous Beams :

7.1 Direct method of drawing influence line diagrams.
7.2 Muller - Breslau principle.
7.3 Drawing influence line diagrams by Muller-Breslau principle.

8.0 Elastic Centre Method :

8.1 Introduction.
8.2 Application to fixed arches.

9.0 Introduction to Plastic Analysis :

9.1 Plastic bending.
9.2 Moment curvature.
9.3 Plastic moment.
9.4 Plastic hinge.
9.5 Load factor.
9.6 Application to beams and frames.
9.7 Plastic analysis of simple statically indeterminate beams and frames.

LABORATORY :

1. Measurement of displacements of plane frames.
2. Experimental analysis of 2-hinged arches.
3. Experimental verification of moment distribution applied to continuous beams.
4. Experimental verification of moment distribution applied to a portal frame.

REFERENCE :

1. Statically Indeterminate Structures
- Chu-kia Wang - McGraw Hill Book Company, Inc.

2. Indeterminate Structural Analysis
- J. Sterling Kinney - Oxford and IBH Publishing Co.

3. Elementary Structural Analysis
- C. H. Norris, J. B. Wilbur and S. Ulka - McGraw Hill International Book Company.

4. Advanced Structural Analysis
– Sidney F. Borg and Joseph J. Gennaro –
D. Van Nostrand Co. Inc.

5. Structural Theorems and Their Applications
– B. G. Neal – Pergamon Press

6. Theory of Structures
– S. Ramamrutham – Dhanpat Rai & Sons

7. Forces in Framed Structures
– T. Lyle Morgan – E & F.N. Spon Limited

8. The Indeterminate Beam
– B. Y. Tonge – London Butterworths

9. Structural Analysis and Design
– R. L. Ketter, G. C. Lee and S. P. Prowel Jr. –
McGraw Hill Book Company

DESIGN OF STRUCTURES I
(STEEL AND TIMBER)
EB 614 CE

Lecture : 4
Tutorial : 3

Year : III
Part : A

1.0 Properties of Structural Steel :

1.1 Types and stess strain characteristics.
1.2 Allowable stresses as per code.
1.3 Usee of steel as a sturctural member in construction.
1.5 Advantages and disadvantages.

2.0 Rivetted Joints :

2.1 Types of joints.
2.2 Types of failures.
2.3 Rivet value and efficiency.
2.4 Design of joint under axial forces.
2.5 Design of a joint under eccentric load.

3.0 Welded Joints :

3.1 Types and stresses.
3.2 Design of joint under axial load.
3.3 Design of joint under eccentric load.

4.0 Axially Loaded Compression Members :

4.1 End conditions and effective lengths.
4.2 Radius of gyration and slenderness ratio.
4.3 Strength of compression members.
4.4 Angle and tubular struts.
4.5 Built-up members.
4.6 Design of compression members.
4.7 Design of lacings.
4.8 Design of battens.

5.0 Eccentrically Loaded Compression Members :

5.1 Stress calculations.
5.2 Design of members.
5.3 Design of column splices.

6.0 Design of Column Bases :

6.1 Design for axially loaded columns.
6.2 Design for eccentrically loaded columns.

7.0 Design of Tension Members :

7.1 Types.
7.2 Net sectional area.

7.3 Design of angles, tees and tubular sections.

8.0 Design of Rolled Section Beams :

8.1 Bending stresses.
8.2 Shear stresses.
8.3 Deflection limitations.
8.4 Design of laterally supported beams.
8.5 Design of laterally unsupported beams.
8.6 Web crippling, buckling and stiffness.
8.7 Design of bearing plates.

9.0 Design of built-up Beams :

9.1 Types used.
9.2 Calculation of cover plates.
9.3 Check for stresses.
9.4 Design rivet connecting cover plates with flanges.

10.0 Design of Plate Girders :

10.1 Elements of a plate girder.
10.2 Economical depth.
10.3 Allowable stresses.
10.4 Design of flanges (including curtailment).
10.5 Design of web plates.
10.6 Design of stiffners.
10.7 Design of web splices.

11.0 Design of Roof Trusses (Angular and Tubular Sections) :

11.1 Terminology.
11.2 Loads on roof trusses.
11.3 Analysis for forces in members and deflections.
11.4 Design for worst condition for members.
11.5 Design of purlins.
11.6 Design of bearings and anchorage.
11.7 Design of wind bracings.

12.0 Design of Timber Structures :

12.1 Types and allowable stresses.
12.2 Design of compression members.
12.3 Design of solid rectangular beams.
12.4 Design of fitched beams.
12.5 Check for deflections.
12.6 Types of joints and their connections.

DRAWING OFFICE :

1. Beam column connection detailing
2. Plate girder detailing
3. Column including base plate, foundation & anchorage details

REFERENCES :

1. Design of Steel Structures
   - B.S. Krishnamachari and D.Ajitha Shimha
   Tata McGraw Hill.

2. Design of Steel Structures.
   - Boris Bresler, T.Y.Lin and J.B.Scalzi
   Wiley Eastern Pvt.

3. Steel and Timber Structures.
   - G.A.Hool and W.S.Kinny
   McGraw Hill.

4. Design of Steel and Timber Structures.
   - S.Ramamrutham
   Dhanpata Rai and Sons.

5. Steel Designer s Manual.
   - Prepared by Construction Research and Development
   Organisation.
   ELBS and Crosby Lock Wood Staples.

6. National Building Code of India; Group 2,Part VI.
   - Structural Design.
   Indian Standards Institution.

DESIGN OF STRUCTURES II
(REINFORCED CONCRETE)
EG 712 CE

Lecture : 4 Year : IV
Practical : 3 Part : 4

1.0 Plain Cement Concrete :

1.1 Constituents of concrete and their properties.
1.2 Water cement ratio, workability, segregation and other properties of green concrete.
1.3 Nominal mix and design mix.
1.4 Introduction to concrete mix design.
1.5 Mixing, compaction and curing.
1.6 Tests for concrete strength.
1.7 Creep, shrinkage, elasticity and other properties of hardened concrete.
1.8 Grades and strengths as per codes.

2.0 Introduction to Reinforced Concrete :

2.1 Limitations of the use of plain cement concrete.
2.2 Necessity of reinforcements and the concept of reinforced concrete.
2.3 Steel as reinforcement.
2.4 Types and properties of steel reinforcements.

3.0 Design Concepts :

3.1 Loads and loadings.
3.2 Stress-strain relations for concrete and steel.
3.3 Methods of design -- working stress, ultimate strength and limit state.

4.0 Theory of Working Stress Method :

4.1 Single reinforced sections.
4.2 Modular ratio.
4.3 Stress and strain diagrams in a section.
4.4 Neutral axis distance and moment of resistance.
4.5 Balanced, over-reinforced and under-reinforced section.
4.6 Modes of failure.
4.7 Design for shear and torsion.
4.8 Design for bond and anchorage.
4.9 Doubly reinforced section.
4.10 Design of flanged beams.
4.11 Columns with axial and eccentric loads.
4.12 General code provisions.

5.0 Requirement Governing Reinforcement and Detailing :

5.1 Requirements for development and anchorage of bars.
5.2 Curtailment of tensile reinforcement.

5.3 Splices.
5.4 Spacing of reinforcement.
5.5 Cover to reinforcement.
5.6 Minimum and maximum reinforcement in beams, slabs, shear, columns, side face etc.
5.7 Minimum and maximum bar sizes used.
5.8 Bar detailing in columns.
5.9 Bar bending schedules.
5.10 Beam-column detailing.

6.0 Limit State Method of Design :

6.1 Concept of limit state.
6.2 Safety and serviceability requirements.
6.3 Characteristic strength of materials and partial safety factors.
6.4 Characteristic loads and their partial safety factors.
6.5 Limit state of collapse in flexure for rectangular sections.
6.6 Limit state of collapse in compression.
6.7 Limit state of collapse in shear.
6.8 Limit state of collapse in torsion.
6.9 Limit state of serviceability in deflection.
6.10 Limit state of serviceability in cracking.

7.0 Design of Various Elements by Limit State Method :

7.1 Singly reinforced beams.
7.2 Doubly reinforced beams.
7.3 One way slab.
7.4 Two way slab.
7.5 Flanged beams.
7.6 Axially loaded columns.
7.7 Eccentrically loaded columns.
7.8 Isolated footings for columns.
7.9 Combined footings.
7.10 Staircase.

8. Introduction to Prestressed Concrete :

8.1 Materials used.
8.2 Prestressing systems and anchorages.
8.3 Loss of prestress; friction.
8.4 Analysis of section for flexure.
8.5 Design of section for flexure.
8.6 Shear, bond, bearing.
8.7 Camber, deflections, cable layouts.
8.8 Introduction to load balancing method.

DRAWING OFFICE :

1. Singly and doubly reinforced rectangular and flanged beams details.
2. One way and two way slab details.

3. Axially and eccentrically loaded column details.
4. Isolated and combined footings details.
5. Staircase details.

LABORATORY :

1. (a) Test a beam in bond/anchorage failure.
   (b) Test a beam in shear failure.
2. Investigate the behaviour of a singly reinforced rectangular simply supported beam. Record the deflection and strains for various loads and cracking patterns.
3. Investigate the behaviour of a doubly reinforced rectangular beam sections.
4. Investigate the behaviour of the collapse of a square RC column.

REFERENCE :

1. Design of Reinforced Concrete Structures
   - P. Dayaratnam - Oxford & IBH

2. Reinforced Concrete Structural Elements
   - Purushottaman - Tata McGraw Hill

3. Plain and Reinforced Concrete Vol.I & III
   - Jai Krishna & O. P. Jain - New Chand & Bros.

4. Reinforced Concrete Design
   - C. K. Wang & Salmon, Harper & Row

5. R.C. Design to CP 110
   - Allen, A.H., C & CA

6. Reinforced Concrete Structure
   - Part and Paulay - Wiley

7. IS Codes 456, 875, 432, 1139, 1786

8. Design aids to IS 456, SP 16

9. British Code CP 110

10. ACI Code 318

11. Notes on ACI 318

12. Detailer's Manual
    - Baker

WATER RESOURCES ENGINEERING COURSES

The courses in Water Resources Engineering (covering hydraulics, hydrology, irrigation and water power engineering) are aimed at providing the students. Fundamentals of hydraulics and hydrology are covered in initial parts before their application to irrigation and water power engineering. In both irrigation and water power engineering papers case studies of irrigation and water power projects in the country have been included where the student is expected to submit a short technical report of the schemes used.

The proposed course is to be supported at appropriate stage by experimental assignment in hydraulics. Three sets have been proposed for these purposes. The first set covers basic principle of hydraulics. The second set covers experimental assignments on application of the principles to different flow situations. The third set covers experiments on dynamic machines.

The content will provide sufficient material in water resources engineering essential for a competent Civil Engineer. This input can act as a background for higher studies in any Water Resources Education.

FLUID MECHANICS
CO 555 CE

Lecture : 3
Tutorial : 1

Year : II
Part : B

1.0 Basic Concept and Definitions ;

1.1 Matter as solid liquid gas, applications of fluid mechanics continuum concept, effects of shear stress on solid and fluid classification of fluid as Newtonian and Non-Newtonian, Ideal and real fluid, concept of control volume.

1.2 Physical properties of liquid; mass density specific weight, specific volume compressibility vapour pressure, surface tension viscosity, Newton's law of viscosity.

2.0 Fluid Statics ;

2.1 Intensity of pressure; pressure depth relationship, pressure at a point, Pascal's law equivalent head, Pressure relationships, measurement of pressure; barometer, piezometer, manometer; U tube. differential principle and use, Bourden gauge.

2.2 Pressure on plane submerged surfaces: centre of pressure, pressure diagram, pressure on curved surfaces, forces on gates, dams and other water retaining structures.

2.3 Flotation, upthrust on immersed surfaces Archimedes' principle, condition of equilibrium stability of floating bodies, meta centre, meta centric height and its determination.

2.4 Fluid within a rigid body subjected to motion; acceleration and rotation.

3.0 Kinematics of Flow ;

3.1 Lagrangian and Eulerian approaches of describing fluid flow; one, two and three dimensional flows; Cartesian and polar cordinates; Discharge; mean velocity of flows; Types of flows as steady, unsteady, uniform, non-uniform, laminar and turbulent; stream lines, streak line path lines stream tube.

3.2 Principle of conservation of mass; Derivation of equation of continuity in two and one dimension, Integral form of continuity equation.

4.0 Dynamics of Flow :

4.1 Various forces acting on fluid Euler equation of motion and its a applicability, Integration of Euler's equation of motion in one dimension to get Bernoulli's equation, Energy of steady fluid flow, Bernoulli's theorem. Introduction to Navier Stokes equation.

4.2 Application of Bernoulli's equation to orifice flow, venturimeter, orifice meter, mouth pieces pitot tube, nozzlemeter, Principle of application to notches and weirs.

4.3 Varying head flow; Emptying and filling of tanks.

4.4 Derivation of momentum equation, application of the equation to calculate forces on pipe bends, reducers; force exerted by jets on moving and stationary vanes of different shapes. Concept of angular momentum: problems of sprinklers.

References :

1. Hydraulics and Fluid Mechanics
- Dr. J. Lal - Metropolitan Book Co. (P.) Ltd.

2. Fluid Mechanics and Hydraulic Machines
- P. N. Modi and S. S. Seth.

3. Fluid Mechanics
- V. L. Streeter - Mc Graw-Hill.

4. Elementary Mechanics of Fluid
- H. Rouse - John Wiley.

5. Fluid Mechanics for Civil Engineers
- N. B. Webber.

4.0 Flow Past Submerged Bodies :

4.1 Drag and lift force definitions Drag on Sphere, cylinder.

5.0 Similitude and Physical Modelling :

5.1 Dimensional Analysis:- Concept of dimension, Experimental necessity of analysis of various engineering flow problems, dimensional homogeneity, dimensional analysis and its applications. Rayleigh's methods and its limitation, Bucklingham II Theorem, Dimensionless numbers, Reynolds, Froude, Mach, Weber, Euler and their representation as ratio of inertial force to various other forces and their significance.

5.2 Applications of dimensional methods, definitions of model, necessity of model studies, objective similitude, modelling criteria, types of models as distorted and undistorted scale effects examples.

5.3 Introduction to mathematical modelling.

LABORATORIES :

1. Pressure due to liquid.
2. Mete-centric height and stability of floating bodies.
3. Flow through venturimeter.
4. Impact on vanes due to jet.
5. Orifice flow.

REFERENCES :

1. Hydraulics and Fluid Mechanics
- Dr. J. Lal - Metropolitan Book Co. (P.) Ltd.

2. Fluid Mechanics and Hydraulics Machines
- P. N. Modi and S. S. Seth.

3. Fluid Mechanics
- V. L. Streeter - Mc Graw Hill.

4. Elementary Mechanics of Fluid
- H. Rouse - John Wiley.

5. Fluid Mechanics for Civil Engineers
- N. E. Webber.

OPEN CHANNEL HYDRAULICS
ED 653 CE

Lecture : 3
Tutorial : 1
Practical : 2/2

Year : III
Part : B

1.0 Introduction and Basic Concept :

1.1 Open channel as mode of water transportation, differences between pipe flow and open channel flow.

1.2 Classification of open channel as natural artificial, prismatic non-prismatic, shapes of channel, geometric properties like area of flow, wetted perimeter, hydraulic radius.

1.3 Classification of open channel flow as steady, unsteady, laminar turbulent, uniform non-uniform super critical sub-critical.

2.0 Uniform Flow :

2.1 Conditions of uniform flow in prismatic channel.

2.2 Introduction to shear stress and velocity distribution.

2.3 Chezy, Manning's equation for Chezys C, relation between Chezy's C, Manning and Darcy's coefficient resistance coefficients.

2.4 Types of uniform flow problems and solutions.

3.0 Economic Channel Section :

3.1 Concept of economic section in keeping cost low.

3.2 Most efficient rectangular, triangular trapezoidal section.

4.0 Flow Over Notches and Weirs :

4.1 Types as broad crested and sharp crested weirs, different shapes.

4.2 Discharge equation for rectangular triangular, trapezoidal cippoleth weirs Francis formula.

4.3 Consideration of velocity of approach ventilation of notch. Advantages of notch.

5.0 Non-uniform Flow in Open Channel :

5.1 Energy and momentum principle for open channel flow.

5.2 Specific energy, critical depth, alternate depths of flow, depth discharge relationship.

5.3 Use of specific energy concept in analysing flow over broad crested weir, flumes, venturi flumes.

5.4 Concept of specific force.

6.0 Gradually Varied Flow :

6.1 Description of water surface profile behind dams and other water retaining structures.

6.2 Governing equations of gradually varied flow; assumptions in deriving.

6.3 Classification of slopes.

6.4 Solution of gradually varied flow equation by graphical and numerical methods.

7.0 Hydraulic Jump and its Analysis :

7.1 Flow conditions for jump, local phenomenon mechanism of energy dissipation and energy loss, dependence upon initial Froude Number. Practical examples of jump at spillway toe, fall etc.

8.0 Introduction to Flood Routing Through Reservoirs and Channels.

9.0 Flow in Non-rigid Boundary Channel :

9.1 Non-rigid boundary channel different from rigid boundary, alluvial channels.

9.2 Effect of shear stresses, incipient motion critical tractive stress, Shield's approach of predicting critical tractive stress.

9.3 Regimes of flow; types of bed forms, values of Manning's for various bed forms.

Laboratory :

1. Energy loss in pipe line (minor and major).
2. Sluice gate operation in open channel.
3. Hydraulic jump in open channels.
4. Flow over notch/weir.

References :

1. Open Channel Hydraulics
   - V. T. Chow - Mc Graw-Hill.
2. Open Channel Flow
   - F. M. henderson - The Macmillan Press.
3. Open Channel Flow
   - R. Ranga Raju.

ENGINEERING HYDROLOGY
EG 613 CE

Lecture : 2
Tutorial : 1

Year : III
Part : A

1.0 Introduction :

1.1 Hydrology as a science of water, scope and application to engineering, Hydrological cycle, Interdisciplinary nature as its influence on agriculture, forestry, water shed management.

2.0 Hydrological Processes :

2.1 Precipitation; causes and classification, Measurement by raingauges, types of raingauges, locations, site selection, errors in measurement, double mass curve method of adjustment, analysis of point rainfall by three methods. Intensity duration curves.

2.2 Snow fall and introduction to snow fall measurement.

2.3 Evaporation and evapotranspiration; definitions, rate of evaporation, factors affecting evaporation meteorological factors like wind speed, radiation sunshine hours.

2.4 Infiltration, its role in distributing water to ground water, definition, interflow, percolation infiltration rate, capacity, factors affecting infiltration and determination of its rate.

3.0 Surface Runoff :

3.1 Stream gauging; selection of site, types of gauges and their selection.

3.2 Velocity area method of stream flow measurement; area measurements, measurement of velocity; using current meter, calibration of current meter, measuring in a river cross section,velocity measurement by floats; surface and subsurface, velocity rods.

3.3 Slope area method of computing discharge.

3.4 Discharge measurement by using notchee and weirs.

3.5 Salt dilution technique, rainfall runoff correlation. Rating curves.

3.6 Factor affecting runoff from a catchment.

4.0 Hydrographs :

4.1 Hydrographs and their analysis, unit hydrograph and its limitations, derivation of unit hydrographs from storms.

4.2 Peak flow estimation of peak flow, empirical methods; rational method and its limitations.

4.3 Frequency, probability concept and recurrence interval, Gumbel's method.

5.0 Ground Water :

5.1 Occurences and distribution of ground water acquifers acquiclaveles, artesian wells.

5.2 Ground water flow, well hydraulics, testing of pumps, recharge.

These following practicals are proposed :

1. Exercise in the use of current meter.

2. Discharge computation by slope - area method.

3. Visit to a hydrological station.

REFERENCES :

1. Hydrology for Engineers
- Linsley Kobler & Paulhus - Mc Graw-Hill.

2. Engineering Hydrology
- Wilson - The macmillan Press.

3. Ground Water Hydrology
- D. Todd - John Wiley.

IRRIGATION ENGINEERING
EG 714 CE

Lecture : 3
Tutorial : 1

Year : IV
Part : A

1.0 Introduction :

1.1 Definitions of irrigation, function and advantages. Status of irrigation development in Nepal.

2.0 Soil Water Relationship :

2.1 General classification of soil for agricultural purposes, soil moisture cropwater requirement, factors affecting cropwater requirements, principle crops and their seasons, water requirement for various crops.

2.2 Method of applying water to irrigation field as surface, sub-surface and sprinkler methods, techniques of surface irrigation, suitability advantages and disadvantages.

3.0 Canals :

3.1 Classification of canals according to function, types as permanent and inundation canal, components of canal system, head works, major canal, branch canal, distributory and water courses.

3.2 Canal alignment.

3.3 Canal losses; seepage and evaporation.

3.4 Assessment of water requirement in canals command area; G.C.A., C.C.A., N.C.A., duty delta and their relationship, base period, kor period and kor depth.

4.0 Design of Canals :

4.1 Uses of Manning uniform flow equation for canal deign.

4.2 Semi-theoretical approaches of canal design.

4.3 Design of stable canal in alluvium, silt theory of Kennedy and Lacey, comparisons, uses of Garrets and and other diagrams.

4.4 Design of lined canals, various types of lining, advantages and economics of lining.

4.5 Cross-section of canal, berms, banks dowels roadways and spoil banks.

5.0 Canal Head Work :

5.1 Function of head works and their types components.

5.2 Principle of design for surface flow; location, water way, shapes.

5.3 Use of hydraulic jump for energy dissipation, stilling basins.

5.4 Principle of design for sub-surface flow safety against piping, uplift, Bligh's Lanes, Khosla's methods of design.

6.0 Distribution System :

6.1 Water distribution system regulation and control canal outlets of different types, design considerations.

7.0 Hydraulic Structures for Canals :

7.1 Different types of hydraulic structures required on canals, cross-drainage work, types design principle; canal falls design consideration, canal escapes, distributory head and other regulation work and their design.

8.0 Water Logging and Drainage :

8.1 Courses and effects of water logging, preventive measures of water logging drainage of irrigated land reclamation of water logged areas by different methods. (More emphasis on draines).

9.0 Flood Control and River Training Work :

9.1 Definition and causes of flood, effects of flood, design flood, flood forecasting, methods of mitigating floods; administrative and engineering methods.

9.2 River training works and its necessity, general considerations of meandering river, degradation and their effects in structures, river training for protection flood control, navigation and guiding flows bank protection and river stabilisation. Examples.

10.0 Case study of irrigation system in Nepal.

References :

1. Fundamentals of Irrigation Engineering
   - Bharat Singh.

2. Irrigation Practices and Designs
   - Kushalani and Kushalani.

3. Theory and Designs of Irrigation Structures
   - R. S. Varsheney.

4. Open Channel Flow
   - R. Ranga Raju.

WATER POWER ENGINEERING
EG 751 CE

Year : IV
Part : B

Lecture : 3
Tutorial : 1
Practical : 2/2

1.0 Introduction :

1.1 Power situation in Nepal and World. Types and classification of hydropower plants as low head, high head, medium head, run off the river, storage and pump storage plants.

1.2 Power variation; daily, weekly, seasonal. Definitions and meaning of terms such as firm power, secondary power, capacity factor efficiency.

1.3 Introduction to power system.

2.0 Planning and Layout of Power Projects :

2.1 Site selection for hydropower projects, essential data requirement, use of flow duration and mass curves. Estimation of power potential. Introduction to reservoir regulation head works, sedimentation, tanks.

2.2 Layout of different types of schemes, reservoir, intake, pen stock, supply conduit, casing, draft tube, tail race.

3.0 Dams :

3.1 Different types of dams based upon function, head, hydraulic considerations and material such as storage, high, overflow, rigid.

3.2 Choice of dam depending upon site condition and economy.

3.3 General consideration for design of dams. Design principle of straight gravity dam considering factors against failure like over turning, tension, sliding, factor of safety against these modes of failure. Foundation grouting, design principle of earth dam considering failure like foundation seepage overtopping, slope stability and limit against piping.

4.0 Spillways :

4.1 Function of spillways, types and capacity, provision of gates.

4.2 Energy dissipation below spillways, need to dissipate excess energy below by hydraulic structures, requirement for dissipation, hydraulic jump as dissipator.

4.3 Stilling basin and other types of dissipator, importance of tail water depth.

5.0 Hydraulic Machines :

5.1 Turbines; classification as Pelton, Francis, Kaplan efficiency, performance characteristics, suitability and uses, specific speed, draft tube, governers, selection.

5.2 Centrifugal pump; efficiency, starting speed layout, vertical turbine pump, selection.

5.3 Reciprocating pump; layout, efficiency and selection.

5.4 Hydraulic ram and its uses. Introduction to tubular bulb turbines.

6.0 Case study of hydropower scheme in Nepal.

Laboratory :

1. Performance characteristics of Pelton turbine.
2. Performance characteristics of Francis turbine.
3. Performance characteristics of Centrifugal pump.
4. Performance characteristics of Reciprocating pump.

References :

1. Water Power Engineering
- M. M. Dandekar and K. N. Sharma.

2. Water Power Engineering
- H. K. Barrowe S. B.

3. Hydraulic Machines
- Dr. J. Lal - Metropolitan Book Co. (P.) Ltd.

4. Water Resource Engineering by Edward Kuiper.

PUBLIC HEALTH ENGINEERING COURSES

The objective of the courses is to impart a sound knowledge in Water Suppply and Sanitary Engineering.The prescribed course of Water Supply Engineering aims at providing a good knowledge in system and management of water supply engineering. After completing this course the students are expected to be fully acquainted with the chemistry and microbiology of water, water resources and their utilization for water supply and water intake construction, construction of water mains and distribution systems and also of water treatment technology. The laboratory works proposed will help the students to feel the subject in depth.

The prescribed course in Sanitary Engineering aims at providing a fairly advanced knowledge of Sewerage System, Sludge treatment, their disposal and environmental sanitation. After completing this course the lstudents are expected to acquire sufficient knowledge to solve the problems of waste water solid disposals and sanitary management of towns as well as villages.

WATER SUPPLY ENGINEERING
EG 656 CE

Lecture : 3
Tutorial : 1
Practical : 2/2

Year : III
Part : B

1.0 Introduction :

1.1. Importance and necessity of water supply schemes.
1.2 Impure water.
1.3 Essentials of water supply engineering.

2.0 Sources of Water :

2.1 Surface sources :- lakes, streams, rivers, impounded reservoirs.
2.2 Run off measurement.
2.3 Mass diagram, problems on the mass diagram.
2.4 Bround sources :- springs, wells and infiltration wells and galleries.
2.5 Yield of the well, tests for yield of well, well interferences, problems on the yield of the wells.
2.6 Selection of the source of water.

3.0 Quantity of Water :

3.1 Types of water demand :- domestic, commercial, industrial, public uses, fire fighting, and losses and wastage.
3.2 Per capita demand and design period.
3.3 Variation in demand of water.
3.4 Factors affecting demand of water.
3.5 Population forecasting and its methods.

4.0 Quality of Water :

4.1 Impurities in water and their classification.
4.2 Living organisms in water :- Viruses, algra, worms, bacteria.
4.3 Water borne diseases.
4.4 Examination of water :- (Introduction only) - physical, chemical and biological.

5.0 Intake Works and Pumps :

5.1 Site selection, design and construction of intakes.
5.2 Characterristics for springs and river intakes.
5.3 Pumps and its classification, horsepower of the pump.

6.0 Water Treatment :

6.1 Objectives, water quality standard for domestic consumption, industry and recreation.

6.2 Treatment system :
- 6.2.1 Screening
- 6.2.2 Plain sedimentation
- 6.2.3 Sedimentation with coguletion, flocculation, clarifier.
- 6.2.4 Filtration
- 6.2.5 Disinfection
- 6.2.6 Softening
- 6.2.7 Aeration
- 6.2.8 Removal of iron and magnese
- 6.2.9 Removal of colour, odour and taste.

7.0 Reservoirs and Distribution System :

- 7.1 Clear water reservoir, service reservoir, balancing reservoir and its capacity determination.
- 7.2 Systems of supply.
- 7.3 Layout of the distribution system.
- 7.4 Design of distribution system.
- 7.5 Pipe network analysis and its methods.

8.0 Conveyance of Water :

- 8.1 Pipe material types :- CI, GI, WI, steel, concrete, AC, and PVC.
- 8.2 Pipe joints and their types.
- 8.3 Laying of pipes.

9.0 Valves and Fittings :

- 9.1 Valves, sluice valve, reflux valve, safety valve, air valves, drain valve.
- 9.2 Fittings :- stop cocks, water taps, bends, break-pressure tank.
- 9.3 Public stand post.
- 9.4 Maintenance of water supply system.

10.0 Introduction to rural water supply system.

LABORATORIES :

1. Physical tests of water
   - temperature
   - colour
   - turbidity
   - pH by pH indicator paper and pH meter
2. Determination of suspended, dissolved and total solids in water
3. Determination of dissolved oxygen in water by Wingler method and D.O. meter
4. Jar test and determination of residual chlorine
5. Bacteriological test - Membrane filtration test

REFERENCES :

1. Text Book of Water Supply and Sanitary Engineering
   – H. K. Hussain – Oxford Publishing Co.

2. Water Supply and Sewerage
   – E. W. Steel and T. J. Macghee

SANITARY ENGINEERING
EG 715 CE

Lecture : 3
Tutorial : 1
Practical : 2/2

Year : IV
Part : A

1.0 Introduction :

- 1.1 Definition of some common terms used in waste water engineering
- 1.2 Objects of sewage disposal
- 1.3 Systems of sanitation :- conservancy system and water carriage system
- 1.4 Sewerage system :- combined, separate and partially separate systems

2.0 Quantity of Waste Water :

- 2.1 Sources of sanitary sewage
- 2.2 Factors affecting sanitary sewage
- 2.3 Determination of quantity of sanitary sewage
- 2.4 Determination of quantity of storm water, run off, time of concentration

3.0 Design and Construction of Sewers :

- 3.1 Design of sewers, design period, flow velocity, flow diagrams
- 3.2 Sewer materials
- 3.3 Shape of sewers
- 3.4 Laying and jointing of sewers
- 3.5 Testing and maintenance of sewers

4.0 Sewer Appurtances :

- 4.1 Manholes
- 4.2 Drop-manholes
- 4.3 Lampholes
- 4.4 Street inlets
- 4.5 Catch basins
- 4.6 Flushing devices
- 4.7 Sand, grease and oil traps
- 4.8 Inverted siphons
- 4.9 Sewer outlets
- 4.10 Ventilating shaft
- 4.11 Pumping of sewage

5.0 Characteristics and Examination of Sewage :

- 5.1 Physical, chemical and biological characteristics of sewage
- 5.2 Sampling of sewage

5.3 Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD)
5.4 Tests of solids, DO, BOD, COD, Nitrogen Chlorive Demand, Chlorides, pH-Valve, and Biological tests
5.5 Stability of waste water

6.0 Sewage Disposal :

6.1 Methods of sewage disposal
6.1.1 Natural methods :- dilution and land treatment
6.1.2 Artificial methods :- primary and secondary treatments

7.0 Sewage Treatment :

7.1 Objects of treatment
7.2 Preliminary treatment processes
7.2.1 Racks or screens
7.2.2 Skimming tanks
7.2.3 Grit chamber
7.2.4 Sedimentation
7.2.5 Chemical precipitation
7.3 Secondary treatment processes
7.3.1 Principles of biological treatment
7.3.2 Sewage filtration, trickling filters and bio-filters
7.3.3 Activated Sludge process, theory, design, aeration, merits and demerits
7.3.4 Oxidation Ponds :- functions, theory and design.

8.0 Sludge Treatment and Disposal :

8.1 Sources of sludge and necessity of treatment
8.2 Aerobic and Anaerobic digestion
8.3 Sludge treatment
8.3.1 Grinding and Blending
8.3.2 Thickening
8.3.3 Stabilization (digestion)
8.3.4 Dewatering
8.3.5 Drying
8.3.6 Compositing
8.3.7 Incineration
8.4 Disposal of sludge
8.4.1 Spreading on land
8.4.2 Lagooning
8.4.3 Dumping
8.4.4 Land filling

9.0 Disposal of Sewage from Isolated Buildings :

9.1 Privies :- Fit privy, aqua privy, dug well privy, cesspools

9.2 Septic Tank :- design and construction
9.3 Disposal of septic tank effluent

10.0 Miscellaneous :

10.1 Solid wastes :- storage, collection and disposal of solid waste
10.2 Environmental sanitation :- ventilation, air-conditioning and lighting

LABORATORIES :

1. Physical tests of sewage:- temperature, colour, total solids
2. Determination of B.O.D.
3. Bacteriological test:- Multiple tube coliform test
4. Determination of ammonia nitrogen and nitrate nitrogen
5. Test of sewage by field kits

FIELD WORKS :

Visits to waste water and solid waste treatment plants.

REFERENCE :

1. Water Suply & Sewerage
- E. W. Steel and T. J. Meghee

2. Sewerage & Sewage Disposal
- L. B. Escritt

3. Water Supply & Waste Disposal
- W. A. Hardenbergh

4. Water & Human Health
- F. E. Mejunkin, 1982, 1983

5. A Guide to Sanitary Engineering Services
- T. A. Tompson, 1972

6. Solid Wastes
- G. Tehobanoglous & others, 1977

7. Water Supply & Sanitary Engineering
- S. K. Husain

8. Water & Waste - Water Technology
- M. J. Hammer, 1975 - John Will & Sons, Inc.

9. Water & Waste - Water Engineering
- G. M. Fair, J. C. Geyer, D. A. Okun, 1966 - John Will & Sons, Inc.

SURVEYING COURSES

The objective of this course is to impart to the students the basic knowledge of different surveying techniques relevant to Civil Engineering works.

The courses Surveying I and II are offered to science intake students in Part A and B respectively of I year and contain fundamental theories and methods of surveying. Surveying III and IV offered in 2nd year contain further Civil Engineering oriented surveying techniques such as laying out of road routes, sewerage and water supply lines, land development, etc. After completion of these courses and a two week field work the students are expected to be able to perform the mentioned works and to evaluate them.

SURVEYING - I
EG 422 CE

Lecture : 3
Practical : 4

Year : I
Part : A (Science Intake)

1. Introduction :

Object of surveying, types of survey, units of measurements, linear measurements, uses of chain, tape, ranging rod and arrows and correction for chain and tape, ground marks, effect of slope, slope measurement, uses of abney level, clinometer and aitimeter.

2. Chain Survey :

Principles, concept of frame work, importance of survey station, and practices of marking them, survey line detail of offsets, check ties, booking, field work, sources of error, accuracy, basic problems in chaining, obstacles in chaining, plotting, conventional symbols.

3. Compass Survey :

Introduction, bearings, theory of magnetic compass, types of compasses, magnetic declination, local attraction and errors in compass survey.

4. Levelling :

Definition, methods of levelling, levelling instruments and levelling staff, temporary adjustment of a level, booking, reducing of levels, sources of error in levelling, plotting of longitudional and cross-section.

Countouring - general, contour internal, characteristics of contours, method of locating contours.

Sight rails and boning rod (travelling rod).

5. Plane Table Surveying :

Principle, accessories, working operations, methods of plane tabling, errors in plane tabling, advantages and disadvantage of plane tabling.

6. Field Work :

Fixing of stations, measurements of

(a) distance and offsets using the chain, tape, ranging rod, arrows and abney level, correction of chain and tape measurements, preparation of field book and plotting.

(b) compass surveying - centering, levelling, reading bearings, compass traversing, detailing, computation and plotting.

(c) levelling - setting up the level, checking profile and cross-sectional levelling, computation and plotting of longitudional section and cross-section.

(d) plane table surveying - setting up the plane table, radiation, intersection and traversing method and plotting.

SURVEYING - II
EG 461 CE

Lecture : 3
Practical : 4

Year : I
Part : B (Science Intake)

1. The Theodolite Introduction :

Principles of operation, methods of reading, temporary adjustment measuring horizontal and vertical angles, face readings, sources of error in theodolite surveying.

2. Traversing :

Flexibility of frame work, booking angles, field procedure, reduction of readings to angles and bearings, checks, computation of co-ordinates - latitude, departure,. adjustment of closing error, plotting traverse survey, effects of accuracy and scale.

3. Tacheometry Introduction :

Optical distance measurement, fundamental concepts, stadia method, tangential method, subtense bar method, booking, reduction to bearings, distance and level, ue of tables, accuracy, plotting.

4. Curves :

Introduction to different curves, their uses, simple circular curves - definitions and notations, designation of curve, elemente of simple circular curve, setting out simple circular curves by ordinates from long chord, by offsets from the tangents and by deflection angles (Rankine's method).

5. Trigonometrical Levelling :

Introduction, height and distances, simple reciprocal trigonometrical levelling.

Reciprocal Levelling, procedure conditions of its requirement.

Field Work :

1. Theodolite :

Setting up and levelling the theodolite, traverse survey, computation and plotting.

2. Techeometry :

Measurements of distance by stadia system, detailing, compuation and plotting.

3. Trigonometry Survey :

Measurements of the height of the building, electric pole etc.

SURVEYING III
EG 517 CE

Lecture : 3
Practical : 4

Year : II
Part : A

1.0 Review of Previous Courses :

1.1 Chaining, taping, compass surveying, levelling, plane tabling and tacheometry.

2.0 Theory of Errors :

2.1 Introduction

2.2 Definition of terms

2.3 Classification of errors

2.4 Weighted observations

2.5 Confidence intervals

2.6 Propagation of systematic and random errors

2.7 Negligibility criterion

2.8 Least square method of adjustment of errors

3.0 Theodolite Surveying :

3.1 Types and specialized uses of theodolites.

3.2 Principles of their construction and sources of errors.

3.3 Measurement of angles and setting out of alignments - repetition method.

4.0 Triangulation and Trilateration :

4.1 Classification and principles of triangulation.

4.2 Accuracy requirements and analysis.

4.3 Introduction to tri-lateration.

4.4 Introduction to EDM instruments.

4.5 Types of EDM instruments and their relevance to specialized purposes.

4.6 Principles of EDM.

5.0 Orientation :

5.1 Intersection and resection.

5.2 Two point and three point problems.

5.3 Problems of tunnelling.

5.4 Correlation between underground and surface survey.

6.0 Vertical Control :

6.1 Different systems ozf level determination e.g., pipe levelling, barometric heighting, spirit levelling, trigonometric heighting.

6.2 Clinometer, abney level and tacheometry - tangential and stadia systems.

6.3 Effect of refraction and curvature.

6.4 Orthometric and dynamic heights.

6.5 Precise levelling.

6.6 The geodetic level.

7.0 Areas and Volumes :

7.1 Derivation of analytical formulas.

7.2 Volume calculation from area and cross-section, area and spot heights and contour maps.

7.3 Calculation methods; graphical, analytical and instrumental.

7.4 Mass-haul diagram and its use.

8.0 Hydrographic Survey :

8.1 Measurement of velocity and flor.

8.2 Vertical control and horizontal control, measurement of c/s.

8.3 Sextant and sounding.

8.4 Echo-sounding.

8.5 EDM sounding etc.

Field Works :

Theodolite traversing.

Field Works :

1. Angle measurement and alignment fixation by repetition method.
2. EDM traversing.
3. Intersection and resection by theodolite.
4. Traversing and levelling for the computatioon of volume of cut and fill in a construction site.
5. Some minor exercises according to the availability of time.
6. Permanent adjustment of level (two peg method).
7. Trigonometrical levelling.

Reference Books :

1. Surveying Theory and Practice
   - Davis; Foote & Kelly, Mc Graw-Hill
2. Surveying for Construction
   - William IRVINE (British Book)
3. Practical Field Surveying and Computations
   - Allam, Hollway and Maynes, Heinemenn (UK)
4. Surveying
   - Bannister, A. and Raymond, S., London, Pitman
5. Advanced Surveying
   - P. Som, B. N. Ghosh, Jadavpur University, Calcutte, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.
6. Surveying Vols II and III
   - Dr. B. C. Punmia

SURVEYING IV
EG 557 CE

Lecture : 2
Tutorial : 2
Practical : 2

Year : II
Part : B

1.0 Spherical Trigonometry and Field Astronomy :

- 1.1 Definition of terms.
- 1.2 Introduction to the study of celestial bodies.
- 1.3 Solution of the spherical triangle, Napier's rule.
- 1.4 Determination of time, time signals.
- 1.5 The Nautical Almanac.
- 1.6 Determination of azimuth by Sun observations.

2.0 Curve Design and Setting Out :

- 2.1 Transition, circular and compound curve (horizontal & vertical).
- 2.2 Development of formulae and preparation of setting out data.

3.0 Construction Surveying :

- 3.1 Reconnaissance.
- 3.2 Different field problems and solution techniques.

4.0 Photogrammetry :

- 4.1 Historical development as a techniques of map making.
- 4.2 Terrestrial and aerial photogrammetry.
- 4.3 Geometry of air survey camera and photograph.
- 4.4 Principles of height and distance determination.
- 4.5 Stereoscopy.
- 4.6 Use of photogrammetry in engineering problems.
- 4.7 Limitations of photogrammetry.

5.0 Remote Sensing :

5.1 Introduction.

6.0 Cartography :

6.1 Introduction.

7.0 Review of different minor and complex instruments and techniques of surveying; their comparative study.

8.0 Planning and execution of surveys in Nepal.

Practicals :

1. Determination of azimuth by Sun observation.

2. Setting out of different shapes of curves.

3. Field visit to land development sites.

4. Stereoscopic viewing of aerial photographs.

5. Minor exercises according to the availability of time.

Reference Books :

1. Surveying Theory and Practice
- Davis; Foote & Kelly, Mc Graw-Hill.

2. Surveying for Construction
- William Irvine (British Book).

3. Practical Field Surveying and Computations
- Allam, Hollway and Maynes, Heinemenn (UK).

4. Surveying
- Bannister, A. and Raymond, S., London, Pitman.

5. Advanced Surveying
- P. Som, S. N. Ghosh - Jadavpur University.
Calcutta, Tata Mc Graw-Hill Publishing Co. Ltd.

6. Surveying Vols II and III
- Dr. B. C. punmia

SOIL MECHANICS AND HIGHWAY ENGINEERING COURSES

Course in Engineering Geology

Students will learn to identify the different types of rocks, rock structures, weathering grades. They will learn about geological maps and will be able to draw dip, strikes, out-crop, stratum contour, fault, fold in maps.

This study will help them to know about Geological structures of Nepal for building structures, dams, roads, tunnels, canals, bridges, rock-fall, erosion, slope stability and ground water development.

Course in Soil Mechanics

The aim of this course is to present the concepts of soil engineering, which is the science and technology of soils and their application to problem in civil engineering. This course identifies the truly fundamental and relevant principles of soil mechanics and presents the clearly and throughly. This course describes the nature of soil problems encountered in civil engineering and gives an overall preview of the behaviour of soil.

Course in Foundation Engineering

This course reviews basic principles of soil mechanics and deals with common type of foundations and retaining structures. The objective of this course is to provide basic concepts and tools applicable to all foundations and retaining structures.

Course in Highway Engineering

At the end of this course the students should be able to :

- perform the construction techniques and design in highways (emphasis will be given to hill roads),
- repair and maintain the highways,
- identify the different construction techniques and designs of bridge and tunnels.

ENGINEERING GEOLOGY
EG 526 CE

Year : II
Part : B

Lecture : 3
Tutorial : 1
Practical : 2/2

1.0 Introduction to Geology :

1.1 Introduction to earth sciences.

1.2 The earth and its structure and environment.

1.3 Scope of geology in civil engineering.

1.4 Earthquake, cause and effect.

1.5 Plate tectonics.

1.6 Volcanoes.

1.7 Fold mountains.

2.0 Crystallography, (Minerals) Basic Principles Only :

2.1 Crystal, lettices.

2.2 Cubic, tetragonal, orthorhombic, hexagonal, monoclinic, system.

2.3 Axis of symmetry, plane of symmetry.

3.0 Minerology :

3.1 Physical properties of minerals.

3.2 Study of important rock forming minerals, as Quartz, feldspar, Muscovite, Biotites, Chlorite, Augite, Hornblende, Olivine, Serpentine, Garnet, Kyanite, Magnetite, Hematite, Limonite, Calcite, Dolomite, Pyrites, Gypsum, Barytes, Bauxite.

4.0 Petrology (Types, Character and Uses Only) :

4.1 Igneous rocks - granite, diorite, gabbro, basalt, dolerite, rhyotite.

4.2 Sedimentary rocks - conglomerate, sand stone, limestone shale, laterite.

4.3 Metamorphic rocks - Gneiss, Schist, Pklhylite, Slate, Quartzite, Marble.

4.4 Quarrying - Building stones, road metals, sand, paving stones.

5.0 Structural Geology :

5.1 Rock deformation - folds, faults, joints, cleavage.

5.2 Outcrop, dip and strike.

5.3 Unconformity.

5.4 Geological maps.

6.0 Rock Weathering :

6.1 Physical and chemical process and product.

6.2 Effect of climate.

6.3 Weathering grades.

7.0 Mass Movement :

7.1 Rock fall, rock slides.

7.2 Hillwash and Mudflow.

7.3 Erosion.

7.4 Slope stability and remedial measures.

8.0 Geology of Water :

8.1 Rivers, erosive process, silting, river profile and systems.

8.2 Hydrogeology :

8.1.1 Ground water.

8.1.2 Zone of saturation.

8.3 Behaviour of water table, acquifer.

8.4 Well springs and reservoirs.

9.0 Site Investigations :

9.1 Site mapping, air photography, terrain evaluation.

9.2 Site investigation techniques - boring, drilling and test method.

9.3 Description of Core for bore - hole logging.

9.4 Application of geology to dams, bridges, tunnels and roads.

Practical :

1. Identification of rocks and minerals.
2. Study of rock structures.
3. Weathering, outcrop.
4. Contour, topographic section, stratum contour.
5. Fault, fold maps.
6. Field trip.

References :

1. A Geology for Engineers
   - Blythe and Frietas - New edition.
2. Principles of Physical Geology
   - Holmes.
3. Geology for Civil Engineers
   - A. C. Mcleem and G. D. Gribble.
4. Geology of Nepal
   - Dr. C. K. Sharma.
5. Ground Water Resources of Nepal
   - Dr. C. K. Sharma.
6. Land Slide and Soil Erosion in Nepal
   - Dr. C. K. Sharma.
7. Site Investigation Manual
   - Weltmar and Head
8. Physical, Mechanical Properties of Rock
   - S. V. Zaleski - Academy of Science, USSR.

ENGINEERING GEOLOGY
EG 556 CE

Lecture : 3
Tutorial : 1
Practical : 2/2

Year : II
Part : B

1.0 Introduction to Geology :

1.1 Geology and its relationship with other Earth Sciences, different branches of Geology.

1.2 Engineering Geology: definition, scope, objective, necessity of engineering geological studies, its importance in Nepal.

1.3 The earth and its structure, various landforms on the surface of the earth: mountains, plateaus, shields.

1.4 Various processes responsible for changing the faces and structure of the earth: plate tectonics, seismicity, volcanism.

2.0 Crystallography, Mineralogy :

2.1 Arrangement of atoms in crystalls, crystal forms and habits, crystal classes.

2.2 Definition of Minerals, physical properties of minerals: habits, cleavase, hardness (Moh's hardness scale), sp. gravity, other properties for classification and identification.

2.3 Important rock forming minerals and their engineering significance: Quartz, Feldspars, Mica, Chlorite, Epidote, Hornblende, Pyroxene, Olivine, Serpentine, Pyrites, Calcite, Dolomite, Opal, Limonite, Gypsum, Clays (Montmorrilonite, Kaolinite, Illite, Gibbsite), Barytes, Bauxite.

3.0 Petrology :

3.1 Definition of petrology, petrographic classification of rocks: Igneous, Sedimentary and Metamorphic rocks, Engineering significance of the three rock classes.

3.2 Macroscopic study of the basic physical and engineering properties of :

Sedimentaries rocks : Clay, Shale, Limestone, Dolomite, Sandstone, Conglomerate.

Igneous rocks : Granite, Rhyolite, Gabbro, Basalt.

Metamorphic rocks : Slate, Phyllite, Schist, Gneiss, Marble, Quartzite.

3.3 (a) Weathering of rocks, weathering classification, weathering grades.

(b) Geological works by wind and water and glaciers.

4.0 Structural Geology :

4.1 Rock deformation - study of folds, faults, joints cleavage.

4.2 Introduction to dip, strike, out crop.

4.3 Unconfirmity.

4.4 Orientation of geological strata, geological maps, plans and cross sections, planes of discontinuities in rock masses.

4.5 Engineering classification of rock masses; classifications by Terzaghi.

5.0 Massmovement and Rock Slope Engineering :

5.1 Types of landslides and factors affecting slope stability, methods of stability and corrective and preventive measures.

5.2 Rock fall, rock slide, mud flow.

6.0 Hydrogeology :

6.1 Morphology of river channel, transportation and deposition.

6.2 Groundwater: Origin occurence and movement of groundwater, permeability and porosity; aquifer, aquiclude, water level and piezometric levels; confined & unconfined aquifers.

6.3 Spring and reservoir.

7.0 Site Investigation :

7.1 Interpretation of topographic maps, aerial photographs and geological maps, use of engineering geological maps for terrain evaluation.

7.2 Site exploration: drilling, test method, borehole logs.

7.3 Geologic investigations for dams & reservoirs, roads & pavements, foundations, bridges and tunnels.

8.0 Engineering Geology of Nepal :

8.1 Geological divisions of Nepal, distribution of different rock/soil types & geological structures and their engineering significance.

9.0 Practical, Laboratory and Fields Works :

9.1 Identification of rocks and minerals.

9.2 Exercises with topographic maps, preparation of pofiles, interpretation of geologic maps and aerial photographs, construction of geological cross sections, preparation of interpretative engineering geological maps.

9.3 Field Trips :

REFERENCES :

1. Attewel, P.B. and Farmer, I.W.; 1975; Principles of Engineering Geology; Chapman & Hall, London. (T.U. Central Library).

2. Krynine, D.P. and Judd, W.R.; 1975; Principles of Engineering Geology & Geotechnics; Mc-Graw-Hill, N.Y. (T.U. Central).

3. Holmes, A.; Principles of Physical Geology; (T.U. Central).

4. Thornbury, W.D.; 1969; Principles of Geomorphology; 2nd ed.; John Wiley & Sons Inc.; N.Y. (T.C. Campus Lib. and T.U. Central).

5. Hoek, E. and Bray, J.; 1981; Rock Slope Engineering, 3rd ed.; The Institution of Mining & Metallurgy; London. (WECS Library).

6. Hoek, E. and Brown, E.; 1980; Underground Excavations in Rocks; The Institution of Mining & Metallurgy; London. (WECS Library).

7. McLeem, A.C. and Gribble, G.D.; Geology for Civil Engineers; ....

8. Blyth, ... and Frietas, ... ; ; A Geology for Engineers; ....

9. I.E. Sandels - Principles of Physical Geology.

10. M.P. Billings - Structural Geology.

11. Todd - Ground Water Hydrology.

12. Gass - Understanding Earth.

13. Sharma, C.K.; ; Landslide and Soil Erosion in Nepal; Sangeeta Prakashan; Kathmandu. (T.U. Central).

14. _____; ; Groundwater Resources of Nepal; Sangeeta Prakashan; Kathmandu. (T.U. Central).

15. _____; ; Geology of Nepal; Sangeeta Prakashan; Kathmandu. (T.U. Central).

SOIL MECHANICS
EG 651 CE

Lecture : 3
Tutorial : 1
Practical : 2

Year : III
Part : B

1.0 Introduction :

1.1 Field of study of Soil Mechanics, basic problems of soil mechanics.

1.2 Historical development of Soil Mechanics as a separate discipline.

1.3 General approach of solving the problems of Soil Mechanics.

2.0 Physical Properties of Soils :

2.1 Soil as a three phase material.

2.2 Phase relationships.

2.3 Sieve and hydrometer analysis.

2.4 Atterberg limit index properties and their determination.

3.0 Soil Classification :

3.1 Different types of engineering and textural soil classification systems.

3.2 Practical implications of soil classification systems.

4.0 Soil Water Interactions (Soil Water Hydraulics) :

4.1 Different forms in which water exists in soil mass.

4.2 Surface tension and capillary phenomena.

4.3 Flow through soil mass.

4.4 Permeability of soils.

4.5 Darcy's law and its range of validity.

4.6 Constant head and falling head methods of permeability determination.

4.7 Flow to a well field methods of permeability determinations.

5.0 Seepage Analysis :

5.1 Basic conditions of flow, Laplace's equation, flow nets and their properties construction of flow nets using different methods (graphical, electrical analogy and seepage models).

5.2 Calculation of flow and seepage forces.

5.3 Seepage through composite sections, earth and rock-fill dams.

5.4 Design of filters.

6.0 Shear Strength of Soil :

6.1 Concept of shear strength.

6.2 Mohr-Coulumb theory of shear strength.

6.3 Mohr's stress circle and failure envelope.

6.4 States of elastic and plastic equilibrium principle of effective stress.

6.5 Concept of pore pressure, measurement of strength parameters.

6.6 Direct shear, unconfined compression, Triaxial and Vane shear tests.

6.7 Drained consolidated (slow test), undrained and undrainded uncondolidated tests.

7.0 Compaction of Soils :

7.1 Compaction process and compaction theories.

7.2 Factors affecting compaction optimum moisture content.

7.3 Compaction tests: standard or proctor compaction test, modified compaction test.

7.4 Field methods of compaction and control of field compaction.

8.0 Stresses in Soils (stress Distribution in Soil Mass) :

8.1 Boussinesq and Westergards theories of stress distribution.

8.2 Principle of super position of load extension to case of circular area, live loads strip loads.

8.3 Effect of layered system of stress distribution.

8.4 Use of tables and charts.

8.5 Elastic settlement and contact pressure.

9.0 Consolidation :

9.1 Concept of consolidation process.

9.2 Spring analogy and Terzaghi's theory of one dimensional consolidation primary and secondary consolidation.

9.3 Degree of consolidation.

9.4 Coefficient of volume decrease, compression index, coefficient of consolidation time factor.

9.5 Settlement calculations, normally consolidated and over consolidated clays.

10.0 Slope Stability :

10.1 Cause of slope movement failure.

10.2 Types of slope failures, stability analysis by circular arc method and method of slices.

10.3 Factor of safety.

10.4 Remedial measures.

One day field trip for soil survey shall be organized.

LABORATORIES :

1. Determination of specific gravity of soils.

2. Sieve analysis of :

   (a) coarse aggregates,
   (b) fine aggregates.

3. Determination of Atterberg limits of soil.

4. In situ density core cutter and sand replacement method.

5. Determination of optimum moisture content and maximum dry density.

6. Determination of shear strength of soil :

   (a) Unconfined compression test,
   (b) Direct shear test,
   (c) Triaxial test.

7. Determination of coefficient of permeability.

8. Consolidation tests.

REFERENCES :

1. A Text Book of Soil Mechanics - Dr. Sengal.

2. Soil Mechanics - Dr. Alam Singh.

FOUNDATION ENGINEERING
EG 711 CE

Lecture : 3
Tutorial : 2

Year : IV
Part : A

1.0 Introduction :

1.1 Soil foundation interaction.

1.2 Functions of foundation.

1.3 Types of foundation and choice of foundation type.

2.0 Site Investigation :

2.1 Field identification tests, planning of investigation works.

2.2 Stages and methods of site investigation works, ground water investigation.

2.3 Sampling disturbed and undisturbed samples.

2.4 Preservation, trannsportation and storage of samples.

2.5 Data recording and logs of subsurface exploration.

3.0 Earth Pressure :

3.1 Initial state of stress in soil mass. Active and Passive earth pressure.

3.2 Earth pressure at rest conditions.

3.3 Coulumb's wedge theory.

3.4 Rankine's theory.

3.5 Culman's construction stability of gravity walls and R.C.C. retaining walls, having vertical or inclined fack face, horizontal and sloping ground surface of the retained soil mass with or without surcharge loads.

4.0 Bearing Capacity of Shallow Foundations :

4.1 Ultimate bearing capacity, allowable bearing capacity.

4.2 Modes of foundation failure Terzaghi's theory.

4.3 Computation of ultimate and allowable bearing capacity of foundations.

4.4 Effect of foundation shape, ground inclination, eccentricities of load, over burden pressure, ground water and non-homogeneous, soil conditions.

5.0 Spread Footings :

5.1 Classification, use of spread footings.

5.2 Design of spread footings bearing capacity and settlement of spread footing.

5.3 Permissible, total and allowable differential settlement.

5.4 Design of footing for uniform settlement: construction of spread footing.

6.0 Mat Foundations :

6.1 Use of mat foundations.

6.2 Types of mat foundations.

6.3 Bearing capacity and settlement of mat foundations.

6.4 Design of mat foundation by conventional method, construction of mat foundation.

7.0 Pile Foundations :

7.1 Use of pile foundations.

7.2 Classification of piles, soil-pile interaction.

7.3 Behaviour of single piles and pile groups.

7.4 Carrying capacity of single pile and pile groups as dependent properties; methods of construction and loading conditions; settlement of pile groups; pile load test; construction of pile foundations.

8.0 Pier and Caisson Foundations :

8.1 Use of pier and caisson foundations.

8.2 Classification of pier and caisson foundations.

8.3 Bearing pressure for pier and caisson foundations.

8.4 Design and construction pier and caisson foundations, sinking of caissons, problems of sinking and remedial measures.

9.0 Coffer Dams :

9.1 Use of cofferdams.

9.2 types of cofferdams stability and settlement of cofferdams construction of cofferdams.

10.0 Sheet Piles :

10.1 Use and types of sheet piles.

10.2 Design of cantilever and deadmen and anchorage systems construction of sheet piling walls.

11.0 Foundation Construction :

11.1 Site preparation.

11.2 Excavation and support of excavation and ground water in excavation and methods of controlling ground water.

11.3 Ground improvement: various methods of ground improvement.

11.4 Monitoring of settlement and/or deformation of foundations and slopes.

11.5 Monitory of pore pressure build up.

12.0 Project work on foundation design and construction.

REFERENCES :

1. Foundation Design and Construction - Tomlinson.

2. Foundation Design and Analysis - Bowles.

3. Soil Mechanics and Foundation Design - Teng W.Y.

HIGHWAY ENGINEERING I
EG 652 CE

Year : III
Part : B

Lecture : 4
Tutorial : 1

1.0 Introduction to Transport System :

1.1 Introduction

1.2 Modes of transportation

1.3 History of roads

1.4 Classification of roads - NRS, IRC

2.0 Road Planning & Engineering Survey :

2.1 Principles of highway planning - Network planing
- Prefeasibility study
- Feasibility study

2.2 Highway alignment - Requirements, factors controlling
- Highway alignment

2.3 Engineering survey - a) Map study
b) Reconnaissance survey
c) Preliminary survey
d) Detail survey

3.0 Geometric Design :

3.1 Elements of cross-section

3.2 Elements of horizontal alignment

3.3 Elements of vertical alignment

4.0 Highway Drainage :

4.1 Introduction

4.2 Surface drainage

4.3 Sub-soil drainage

4.4 Cross-drainage (only culvert with design)

5.0 Hill Roads :

5.1 Introduction

5.2 Special consideration in hill road design (alignment, cross-section, geometric elements etc).

5.3 Special structures in hill road (retaining structure, drainage structure & stability of formation slope).

6.0 Highway Pavement :

6.1 Introduction

6.2 Pavement structure & its components

6.3 Pavement design

6.4 Behaviour of highway materials

6.5 Design of flexible pavement

6.6 Design of rigid pavement

7.0 Course Project on Highway Design.

REFERENCE :

1. Transportation Engineering (I & III)
- V. N. Vazirani, S. P. Chandola - Khanna Publishers, Delhi - 6.

2. Highway Engineering
- Vaswani N. K. - Roorkee Publishing House

3. Highway Engineering
- Khanna S. K., Justo C.E.C. - Nemchanda & Bros., Roorkee.

4. A Text Book on Highway Engineering and Airports
- Sehgal S. B., Bhanot K. I. - S. Chand & Co. Ltd., Delhi.

5. Airport Planning & Design
- Khanna S. K., Arora M. G. - Nemchanda & Bros, Roorkee, UP, 1971.

6. Principles and Problems of Highway Engineering
- Sharma R. R., Sharma S. K. - Asia Publishing House.

7. Highway Material Testing
- Khanna S. K., Justo C.E.C. - Nemchanda & Bros., Roorkee.

8. A Course in Highway Engineering
- Bindrar S. P. - Dhampat Rai & Sons, Delhi.

HIGHWAY ENGINEERING II
EG 713 CE

Year : IV
Part : A

Lecture : 5
Practical : 2

1.0 Highway Materials :

1.1 Introduction & classification of materials
1.2 Aggregates & its tests
1.3 Bituminous material and its tests
1.4 Bituminous mix & asphalt concrete (including design)

2.0 Road Construction :

2.1 Introduction to road construction technology
2.2 Road construction equipment
2.3 Earth work in embankment and cutting
2.4 Construction technology of low cost roads (Earthen, Gravel, W.B.M. & stabilization roads)
2.5 Construction of bituminous roads
2.6 Construction of cement concrete roads

3.0 Traffic Engineering :

3.1 Introduction
3.2 Traffic studies - (road users, vehicle, speed, capacity, origin & destination, accidents & its preventive measures, parking).
3.3 Traffic operation - (regulation and control-device)
3.4 Traffic intersection
3.5 Road lighting

4.0 Highway Maintenance :

4.1 Introduction
4.2 Classification of maintenance
4.3 Types of failures & its causes
4.4 Maintenance operation (low cost roads, bituminous road, cement concrete road)
4.5 Maintenance of drainage structures
4.6 Maintenance of shoulder, formation slopes, road furnitures

5.0 Bridges :

5.1 Definition, components of a bridge and different types of bridges.
5.2 Classification of bridges.
5.3 Site investigation, fixing max. flood, design from flood data, linear water-way, economic span, location of piers and abutments.
5.4 Types of foundations need for bridges.

6.0 Tunnels :

6.1 Introduction, advantages of tunnelling, economics of tunnelling.
6.2 Tunnel surveying.
6.3 Design of tunnels shape and size of tunnels, tunnel alignment shafts.
6.4 Methods of tunnelling in soft strata and tunnelling.
6.5 Methods of tunnelling in rock strata and tunnel lining.
6.6 Safety measures, ventilation and lighting, drainage.

LABORATORY :

1. Impact value
2. Los Angele's abrasion value
3. CBR test
4. Viscosity test
5. Softening point teest
6. Penetration test
7. Ducfility test
8. Marshall stability test

ALLIED COURSES

Course in Electrical Engineering

The objectives of this course are :

- to enable the students to understand and apply basic principles of electricity in solving DC & AC circuits.
- to familarize the students with the principles of Electromagnetism and their application in Electrical machines.

Course in Mechanical Technology

The course aims to make the students informed about the basic principles of machines which they could, normally, be expected to come across in the practice of civil engineering profession.

It provides insight into the principles of mechanisms, basic machine components, machine tools, and fabrication processes. It also deals with various aspects of lubrication which are very important for the machines of all kinds.

Course in Basic Electronics

The objective of the course is to make the students capable of :

- understanding the basic principles of electronic devices and circuits, applied in Civil Engineering works.
- relating application of simple electronic test instruments designed for Civil Engineering and other electronic equipment applicable to this profession.

Course in Computer Programming and Numerical Method

The objectives of this course are :

- To introduce Computing and Computers
- To teach Computer Programming Techniques using popular programming language (especially micro-computer programming language)
- To emphasise the use of Computer in Civil Engineering problems.
- To introduce numerical approximation methods and use Computer to solve some of those methods.

Course in Urban and Regional Planning

This course traces the development of human settlements with the objective of illustrating the underlying concepts in the evolutionary growth of urban and regional planning. The various essential features of urban and regional planning are explained, focussing on such vital issues as housing vis-a-vis the polarisation centres in Nepal.

PRINCIPLES OF ELECTRICAL ENGINEERING
EG 514 CE

Year : II
Part : A

Lecture : 2
Tutorial : 2
Practical : 2/2

1. Introduction :

   1.1 Role of electricity in modern society

   1.2 Energy resources and productions

   1.3 Generation, transmission and distribution, consumption of electrical energy - simple qualitative treatment

2. D. C. Circuits :

   2.1 Source of Electromotive Force (EMF) potential difference, electric current

   2.2 Conductors and insulators

   2.3 Resistance

   2.4 Ohm's law, application

   2.5 Resistances in series, parallel, series and parallel connections

   2.6 Specific resistance

   2.7 Temperature coefficient of resistance

   2.8 Kirchhoff's laws, applications

   2.9 Star - Delta, Delta - Star transformations

   2.10 Thevenin's theorem, Superposition theory

3. Electrical Power and Energy :

   3.1 Electrical power, energy, torque

   3.2 Energy conversion

   3.3 Joule's law, mechanical equivalent of heat

4. Electrostatics :

   4.1 Electric charges

   4.2 Coulomb's law - force acting between charges

   4.3 Electric induction

4.4 Capacitance

4.5 Capacitors in series, parallel

4.6 Voltage distribution in capacitors connected in series.

4.7 Energy stored, dielectric strength, time constant

5. Chemical Effect of Electricity :

5.1 Faraday's laws of electrolysis, application

5.2 Electroplating

5.3 Primary and secondary cells

5.4 Lead - acid accumulators, charging, discharging

5.5 Cells in series and parallel, equivalent emf.

6. Electromagnetism :

6.1 Magnetic field round a conductor carrying current

6.2 Solenoid

6.3 Cork - screw rule

6.4 Magnatomotive force (MMF), magnetic flux, flux density, magnetising force, permiability, reluctance

6.5 B-H curves

6.6 Magnetic circuits - series and parallel

6.7 Force on a conductor carrying current across a magnetic field

6.8 Fleming's left hand rule

6.9 Faraday's law of electromagnetic induction, Lenz's law

6.10 EMF induced, right hand rule

6.11 Qualitative idea of Hysteresis and Eddy current losses

7. A. C. Circuits :

7.1 Peak, average and RMS values of sinusoidal voltage and current.

10.4 Characteristics - torque - slip, speed - torque

10.5 Universal characteristics of induction machine, regime of generation alternator

11. Synchronous Machines :

11.1 Synchronous speed

11.2 Potating electromagnet system, it's advantages

11.3 EMF equation, armature reaction (qualitative treatment only), parallel operation, synchronisation

11.4 Synchronous motors, characteristics, V curves, uses.

Lab Works in Principles of Electrical Engineering :

1. Basic Electrical Measurements :- Measurement of voltage, current and resistance by volt meter and ammeter method, use of multimeter and megger.

2. Verification of Ohm's Law :- Series and parallel connections of resistances and cells.

3. A. C. Measurements :- Measurement of power and power factor. Connection of KWH meter.

4. Characteristics of D.C. machine.

5. Characteristics of A.C. machine.

6. Sinchronisation.

Reference Books :

1. Applied Electricity - By H. Cotton.

2. A. Kasatkin, M. Perakalin, Basic Electrical Engineering. MIR publisher, Moscow, 1970.

3. J. B. Gibbs - Transformer Principles and Practices - Hill Book Company, New York, 1950.

capacitive circuits, voltage and current waveforms

7.3 Reactance, impedance

7.4 Impedance triangle

7.5 R,L,C, series, parallel, series and parallel circuits

7.6 Resonance in series and parallel circuits

7.7 Power, power factor, reactive power

7.8 Introduction to three phase system-balanced star, delta connections

7.9 Relation between line and phase quantities

7.10 Power in balanced 3 phase system

8. Transformers :

8.1 Principle of action

8.2 EMF equation

8.3 Voltage and current ratios

8.4 Voltage regulation

8.5 Efficiency

8.6 Types, constructional features, uses

9. D. C. Machines :

9.1 D. C. generators, principle of action, EMF equation, methods of excitations, elementary idea of armature reaction and its effects on performance characteristics

9.2 D. C. motors, principle of operation, back emf.

9.3 Mechanical characteristics, starting, speed control, uses.

10. Asynchronous Motors (Induction Motors) :

10.1 Rotating magnetic field - working principle

10.2 Constructional features

10.3 Squirrel - cage and slip - ring types of rotors

ELECTRICAL ENGINEERING
EG 514 CE

Lecture : 4
Practical : 2/2

Year : II
Part : A

1. Introduction :

   1.1 Role of electricity in modern society
   1.2 Energy resources and productions
   1.3 Generation, transmission and distribution, consumption of electrical energy - simple qualitative treatment
   1.4 Review of basic laws of electricity - Ohm's law, Circhhoff's law series and parallel connections of resistors, capacitors and EMFs

2. Electromagnetism :

   2.1 Magnetic field round a conductor carrying current
   2.2 Solenoid
   2.3 Cork - screw rule
   2.4 Magnetomotive force (MMF), magnetic flux, flux density, magnetising force, permiability, reluctance
   2.5 B-H curves
   2.6 Magnetic circuits - series and parallel
   2.7 Force on a conductor carrying current across a magnetic field
   2.8 Fleming's left hand rule
   2.9 Faraday's law of electromagneric induction, Lenz's law
   2.10 EMF induced, right hand rule
   2.11 Qualitative idea of Hysteresis and Eddy current losses

3. A.C. Circuits :

   3.1 Peak, average and RMS values of sinusoidal voltage and current
   3.2 Phasor representation - resistive, inductive, capacitive circuits, voltage and current waveforms
   3.3 Reactance, impedance
   3.4 Impedance triangle
   3.5 R,L,C, series, parallel, series and parallel circuits
   3.6 Resonance in series and parallel circuits
   3.7 Power, power factor, reactive power
   3.8 Introduction to three phase system-balanced star, Delta connections
   3.9 Relation between line and phase quantities
   3.10 Power in balanced 3 phase system

4. Transformers :

4.1 Principle of action
4.2 EMF equation
4.3 Voltage and current ratios
4.4 Voltage regulation
4.5 Efficiency
4.6 Types, constructional features, uses

5. D.C. Machines :

5.1 D.C. generators, principle of action, EMF equation, methods of excitations, elementary idea of armature reaction and it's effects on performance characteristica
5.2 D.C. motors, principle of operation, back EMF
5.3 Mechanical characteristics, starting, speed control uses

6. Asynchronous Motors (Induction Motors) :

6.1 Rotating magnetic field - working principle
6.2 Constructional features
6.3 Squirrel - cage and slip - ring types of rotors
6.4 Characteristics - torque - slip, speed - torque
6.5 Universal characteristics of induction machine, regime of generation alternator

7. Synchronous Machines :

7.1 Synchronous speed
7.2 Rotating electromagnet system, it's advantages
7.3 EMF equation, armature reaction (qualitative treatment only), parallel operation, synchronisation
7.4 Synchronous motors, characteristics, V curves, uses

8. Circuit Protection and Control Devices :

8.1 Fuses, application, characteristics, selection
8.2 Automatic circuit breakers, applications
8.3 Electromagnetic contactor, Bimetallic relay
8.4 High voltage circuit breakers (OCB)
8.5 Electro-magnetic Relays instantaneous and with time delay

LABORATORIES :

1. Basic electrical measurements :

Measurement of voltage, current and resistance by volt meter and ammeter method, use of multimeter and megger.

2. A.C. measurements :

   Measurement of power and power factor.
   Connection of KWH meter.

3. Characteristics of DC machine.

4. Characteristics of AC machine.

REFERENCES :

1. Applied Electricity
   - H. Cotton.

2. Basic Electrical Engineering
   - A. Kasatkin, M. Perakalin - Mir Publisher, Moscow.

3. Transformer Principles and Practices
   - I. B. Gibbs, Hill Book Company, New York.

MECHANICAL TECHNOLOGY
EG 516 CE

Lecture : 3 hrs./week
Tutorial : 1
Practical : 2

Year : II
Part : A

1.0 THEORY OF MECHANICS

1.1 Kinematics of Machines :

1.1.1 Basic concepts, motion analysis - displacement, velocity and acceleration of mechanism, elements of a kinematic chain, mechanism and machine.

1.1.2 Velocity and acceleration diagrams. Static and dynamic force analysis.

1.1.3 Friction. Belt and rope drives. Gear drives; simple and compound gear drives. Comparative study of mechanical drives.

1.1.4 The role of mechanical handling equipment, its application to various industries. Components and theory of hoisting equipment.

2.0 TYPES OF FABRICATION

2.1 Forging. Casting and Welding. Their relative merits and demerits.

2.2 Principle of casting - casting methods such as sand and die casting, their differences.

2.3 Gas welding and Arc welding-methods and their differences. Brazing and Soldering and their applications.

3.0 LUBRICATIONS AND BEARINGS

3.1 Types of bearings and their difference, types of lubricants and their properties, methods of lubrication.

3.2 Planned maintenance and lubrication of mechanical hydraulic plant and equipment.

4.0 WORKSHOP PRACTICE

4.1 Introduction to safety measures, introduction to the

of cutting tools, selection of cutting, speeds and feeds etc. regarding basic machine tools e.g. lathe, shaping slotting, milling drilling and grinding machines.

4.2 Introduction to Gas and Arc welding processes, soldering and brazing.

4.3 Exercises : Simple jobs on centre lathe and shaping machines and welding.

4.4 Demonstration : Slotting milling and grinding machines.

References :

1. Workshop Technology Part I and Part II

By W. A. J. Chapman
Publisher - English Language Book Society
(Low priced text book series)

2. Theory of Machines

By Dr. Jagdish Lal and Prof. J. M. Shah
Metropolitan Book Co. (Pvt.) Ltd.
Netaji Subhhash Marg, New Delhi.

3. Process and Materials of Manufacture

By Roy A. Lindlerg
Prentice Hall of India (Pvt.) Ltd.
New Delhi.

MECHANICAL TECHNOLOGY
EG 516 ME

Lecture : 3
Tutorial : 1
Practical : 2

Year : II
Part : A

1.0 Thermodynamics :

1.1 Review of gas laws, energy and heat.
1.2 First law of thermodynamics.
1.3 Second law of thermodynamics :
(a) Statements of second law.
(b) Consequences of second law.
1.4 Carnot cycle.
1.5 Otto cycle.
1.6 Diesel cycle.

2.0 Internal Combustion Engines :

2.1 Differences between the internal combustion engines and external combustion engines.
2.2 Working Principles of :
(a) Two stroke petrol engine.
(b) Four stroke petrol engine.
(c) Diesel engine.
2.3 Principle of operation of air cooling and water cooling normally used for the I.C. engines.
2.4 Functions and properties of lubrication oils. Gradings.

3.0 Theory of Machines :

3.1 Differences between mechanism and machine.
3.2 Working principles and the normal applications of :
(a) Belts
(b) Chains
(c) Shaft
(d) Gear trains

4.0 Workshop Technology :

4.1 Introduction to safety measures and first aid.
4.2 Principles of brazing, soldering and welding.
4.3 Construction and working principles of (simple) :
(a) Drilling machine
(b) Simple grinding machine
(c) Lathe machine
(d) Shaping machine
4.4 Different type of operations that can be performed in above machines.

5.0 Hydraulic Machines :

5.1 Review of Newtons second law of motion, linear momentum equation, and impulse momentum equation.

5.2 Dynamic force exerted by fluid jet on :
- (a) Stationary flat plate
- (b) Inclined plate
- (c) Moving flat plate

5.3 Principle of operation and the description of the functions of the main components of :
- (a) Pelton turbine
- (b) Francis turbine
- (c) Cross flow turbine
- (d) Impulse reaction turbine
- (e) Reciprocating pump
- (f) Centrifugal pump

PRACTICAL :

1.0 Workshop Technology :

1.1 Handson experiences with simple jobs involving :
- (a) Electric arc welding
- (b) Drilling
- (c) Operation of lathe machine

2.0 Internal Combustion Engines :

2.1 Familiarization with different types of I.C. engines by observing such engines in laboratory.

REFERENCES :

1. Workshop Technology
- W.A.J. Chapman - English Language Book Company, (Low priced text book series).

2. Theory of Machines
- Dr. Jagdish Lal and Prof. J. M. Shah - Metropolitan Book Co. (Pvt.) Ltd., Netaji Subhhash Marg, New Delhi.

3. Process and Materials of Manufacture
- Roy A. Lindlerg - Prentice Hall of India (Pvt.) Ltd., New Delhi.

BASIC ELECTRONICS
EG 553 CE

Lecture : 3
Tutorial : 2

Year : II
Part : B

1.0 Introduction :

- 1.1 Importance of electronics in modern society
- 1.2 Description of information transmission by telephone, telex, teleprinter, CCTV, radio telegraphy, facsmile
- 1.3 Global satellite communications
- 1.4 Electronics used in Civil Engineering

2.0 Introduction to Electronic Components and Circuits :

- 2.1 Resistor, Capacitors, Inductors
- 2.2 Introduction to vacuum tube devices
- 2.3 Semi-conductor devices :- P type & N type semi-conductors, diodes, transistors, FET, MOSFET, LED, LCD - their basic characteristics, specialities and uses
- 2.4 Brief description of integrated circuits (IC)
- 2.5 Optical electronics
- 2.6 Power electronics
- 2.7 Telephone, microphone, speakers, megaphones
- 2.8 Electronic control systems

3.0 Amplifiers and Oscillators :

- 3.1 CE, CC and CB amplifiers - their characteristics, specialities and uses
- 3.2 Class A,B,C and AB amplifiers - their characteristics, specialities and uses
- 3.3 Feedback and its importance
- 3.4 Operational amplifiers
- 3.5 Principle of Oscillators
- 3.6 Simple Oscillator circuit

4.0 Introduction to Transmission :

- 4.1 Radio frequency spectrum (frequency ranges and their uses)
- 4.2 Modes of radio emissions
- 4.3 Antennas
- 4.4 Types of modulation

5.0 Introduction to Communication Equipment :

- 5.1 Transmitters (AM, FM, SSB)
- 5.2 Receivers (AM, FM, SSB)

5.3 Transceivers
5.4. Mobile communication
5.5 Video communication (CCTV, TV)

6.0 Electronic Instruments and Measurements :

6.1 Ammeters, voltmeters, ohmmeters, meggers and multimeters - their applications
6.2 CRO - its application
6.3 Voltage regulators
6.4 Application of X-ray, laser and ultrasonic equipment used in Civil Engineering
6.5 Measurement of pressure, torque, vibration, water flow, thickness, humidity, displacement, velocity and acceleration using electronic instruments

7.0 Digital Electronics and Computers :

7.1 Binary scale
7.2 Logic circuits
7.3 Counters, registers, memory circuits
7.4 Microprocessors
7.5 Analogue and digital computers
7.6 Application of computers in Civil Engineering

REFERENCES :

1. Basic Radio, Vol.1 - 6 by Marvin Tepper.

2. Electronic Principles - A. Malvino.

3. A Course in Electrical & Electronic Measurements and Instrumentation by A. K. Sawhney.

4. Electronics made simple by Henry Jacobowytz.

5. Electronic Fundamentals and Applications by John D. Ryder.

6. Digital Techniques by Green.

7. Integrated Electronics - Milliman and Halkias.

8. Foundation Instrumentation by Hanna.

9. Experimental Stress Analysis and Motion Measurement by Dover and Adams.

10. Digital Electronics and Computers by A. Malvino.

11. Electronic Communication System by G. Kennedy.

COMPUTER PROGRAMMING AND NUMERICAL METHODS
EG 615 CE

Lecture : 3 Year : III
Tutorial : 3 Part : A

1.0 Computers and Programming :

1.1 Computer concepts; history of computer development; fundamental hardware concepts; computer's architecture and peripherals.

1.2 Binary, octal, decimal and hexadecimal number, systems and conversions; bit, byte and word; binary coding systems; binary coded decimal system; machine language; compiler, interpreter.

1.3 Problem definition, analysis, algorithm flowchart and coding into high level language.

1.4 Subscripted variables; dimension statements; input/ output statements; data statements; control statements; loop instructions; character string manipulations.

1.5 Subroutines, modular programming concepts, program documentation.

2.0 Numerical Methods :

2.1 System of linear algebraic equations and solution by elimination and iterative techniques; Gauss elimination, Gauss-Jordan elimination, Gauss-Seidel iteration.

2.2 Newton-Raphson method for solving non-lineer equation.

2.3 Numerical differentiation; numerical integration solution by; trapezoidal, midpoint and simpson's rules.

2.4 Numerical solution of ordinary differential equations solution by; Taylor series method, improved euler method, Runge-kutta method.

3.0 Applications :

3.1 Programming examples applicable to Civil Engineering problems.

Examples :
Problems in surveying, strength of materials, and fluid mechanics.

Notes :

- Theory classes should be followed by practical programming seessions.

- Students will be expected to write computer programs for some of the above numerical methods.

REFERENCES :

1. Numerical Methods in Fortran
- J. M. Mc Cormic and M. G. Salvadori - Prentice Hall of India (1974).

2. Fortran IV Programming and Applications
- C. Joseph Sass - Hodedn - Day, Inc., San Francisco (1974).

3. Elementary Basic with Applications
- Mario V. Farina - Prentice Hall, Inc., Englewood Cliffs, New Jersey (1970).

4. Computer Programming in Fortran IV
- V. Raja Raman - Prentice Hall of India Pvt. Ltd., New Delhi 110001, (1982).

5. Introduction of Basic Programming
- Steven L. Mandell - West Publishing Company, San Francisco, U.S.S. (1983).

URBAN & REGIONAL PLANNING
EG 752 CE

Lecture : 3
Tutorial : 1

Year : IV
Part : B

1.0 Introduction to Urban & Regional Planning :

1.1 Brief explanation of the concept of urban and regional planning.
1.2 Importance of this study in the overall perspective of the growth of human settlements.

2.0 Introduction to Human Settlements - Both Rural & Urban :

2.1 Importance of the study of human settlements to gain insight into the complexity of the mechanism of planning methodologies.
2.2 The classic patterns of growth of human settlements touching on :
2.2.1 rectilinear gridiron configuration growth mainly on flat riverside floodlands, which were essentially agricultural areas to which the rectilinear configuration was extremely suitable.
2.2.2 circular configurational growth, which was essentially a reflection of lifestyle of the hunters (for defense), the herdsman (who needed maximum area and minimum perimeter to pen his stock), and the warriors, who needed a defensive ring to keep the enemy out.
2.2.3 Radio - centric configurational growth, which resulted from circular forms growing outward radially, with the wedgeshaped areas between the radials filling in gradually.
2.2.4 Linear configurational growth, which was mainly restricted to sites along the river banks and/or srterial trade routes.
2.3 Factors that promoted the growth of human settlements such as :
2.3.1 climatic conditions, viz.: extremes of climate generally tended to discourage growth.
2.3.2 physical features: again the more rugged and harsh the physical features were, the sparser was the density of the resident population and slower was their growth.
2.3.3 resources: the availability of resources, especially valuable resources, always had a catalytic effect on growth.

3.0

4.0

2.3.4 location: certain sites that were strategically placed in terms of defense, commerce, industry etc; tended to act as focal points of growth.

2.3.5 innovations: new, useful innovations generally tended to accelerate the art of settlement design, eg. in old agricultural societies, such an innovation as the plow, which boosted food production by increasing the area under cultivation, also minimized the duration of back-breaking physical labour allowing the farmers some free time to devote to other pursuits such as trade, commerce, arts, pleasures etc.

2.4 An overview of some historical settlements to try to understand not only the concept of their growth but also to understand the interaction of various growth factors.

3.0 Focus on Traditional Urban Design and Rural Spatial Systems in Nepal :

3.1 Explanation of the morphology of rural settlements and regional spatial systems.

3.2 Tracing the beginning of traditional urban design in Nepal.

3.3 Special emphasis on the urban growth of the three main urban centres of the Kathmandu Valley viz. Kathmandu, Patan and Bhadgaon, explaining how the main urban features have been interwoven into interesting urban forms.

3.4 Focus on the Durbar Squares as exemplary historical urban design.

4.0 Introduction to Modern Practices in Urban & Regional Planning :

4.1 An overview of some of the modern practices in urban and regional planning with relevant examples, preferably drawn from new towns and cities which have been ibuilt around the world in the last 3-4 decades.

4.2 Explanation to highlight the complexity of modern practices as related to urban & regional planning by touching on the diverse activity systems, and how they are translated into plans by professionals of various disciplines who work as a team to realize the aspirations of those who are expected to live in the plans that are formulated.

4.3 Explanation of the concept of a comprehensive land use plan that incorporates the various land uses - residential, commercial, industrial etc., that form the framework of the urban structure.

4.4 Relevant introductory exercises to develop a rudimentary ability to formulate land-use plans.
4.5 Focus on the urban and regional activity systems and their intra and inter-relationships.

5.0 Focus on Integrated Rural Development & Rural Centres with Reference to Nepal's Development Regions and Polarisation Centres :

5.1 Development, Underdevelopment and Uneven Development :
- 5.1.1 Development indicators economic, social and psychological
- 5.1.2 Spatial, sectoral and social inequelitish and causes of uneven development and economic polarization process
- 5.1.3 Michanisms to close developmental disparities, natural processes and interventions

5.2 Integrated Rural Development and Rural Centres; Concepts :
- 5.2.1 Decentrilization and growth polis
- 5.2.2 Provisions of services and their efficiency. Seneration of income to meet basic needs
- 5.2.3 Settlement polarization and continuing outward migration
- 5.2.4 Hierarchy of service centres

5.3 Integrated Rural Development in Practice :
- 5.3.1 Experience of Bangladesh and China

5.4 Efforts in Nepal, Case Studies :
- 5.4.1 K.B.I.R.D.
- 5.4.2 S.I.R.D.
- 5.4.3 R.C.U.P.

(Extensive Evaluation of one input area).

6.0 Focus on Housing :

6.1 Explanation of housing within the context or urban & regional planning.
6.2 Housing types - private housing, housing, housing for low income group, self help, core housing, industrialized housing, etc.
6.3 Site planning including planning of services.

REFERENCES :

1. The Urban Pattern
- Arthur B. Gallion & Simon Easirer - City Planning & Design.

2. Urban Design
- Paul D. Spreiragen - The Architecture of Towns & Cities.

3. The Traditional Architecture of Kathmandu Valley
- Wolfgang Korn.

4. Nepalese Architecture
- N. R. Banerjee.

5. Indian Architecture
- Pery Brown.

6. Town & Country Planning
- K. S. Rane Bowda.

ELECTIVE AND PROJECT WORK COURSES

Courses in Electives

The aim of the elective subjects is to have an advanced knowledge in selected topic or topics within subject areas in which the students may have a special interest.

Two different subject areas will be offered as Elective I and Elective II.

Each student will be required to follow studies in a selected topic or topics within two subject areas in which he may have a special interest. One subject area chosen will fall under Elective I and the other under Elective II.

Courses in Project

The aim of the project is to make the students capable of tackling extensive problems related to Civil Engineering with application of knowledge gained during the whole course.

Study Tour

The aim of the study tour is to familiarise the students with the practical aspects of civil engineering projects and works.

	ELECTIVE I EG 75. CE*	ELECTIVE II EG 75. CE*	
Lecture :	3	3	Year : IV
Tutorial :	2	2	Part : B

1. Each student will be required to follow studies in a selected topic or topics within two subject areas in which he/she may have a special interest. One subject area chosen will fall under Elective I and the other under Elective II.

2. Topic will of necessary vary in length and the number of topics which can be covered in any subject area will very accordingly.

3. To maintain an acceptable student - staff ratio in each optional course of study, depending upon the interests and specialisms of the member staff involved and the facilities available, a limited number only of subject areas and of topics within a subject area would be offered at any time.

4. Topics which have already been covered to some extent earlier in the course could be studied in greater depth while some new topics could be introduced.

5. A typical range of topics within each subject area are as follows : (other subjects and topics may be offered).

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* Begins from EG 755 CE (depending upon courses offered).

PROJECT WORK
EG 754 CE

Practical : 7

Year : IV
part : B

Under the supervision and guidance of a member/members of faculty each student is required to carry out an individual or group project which provides opportunities for tackling extensive actual field related problem to Civil Engineering and is required to submit a project report.

The choice of a project will depend upon the interests of the student(s), faculty and the facilities available in the campus.

A project may involve :-

(a) An experimental investigation,

(b) Preparation of a dissertation involving a literature survey and a correlation of existing knowledge,

(c) Preparation of a design for an extensive Civil Engineering Project.

NOTE :

The project will be conducted under the guidance of the member/members of faculty as they fit beneficial to the students. In the initial phase the faculty may conduct a number of lectures and discussions as to the approach of the project. In the latter phase the student will be left on his own to persue his work and to consult the faculty whenever any problem crops up. He should then submit a draft report prior to the final report so that the guide can correct gross mistake. The final report should be submitted to the Department Head in duplicate.

STUDY TOUR

1. Each batch of the students will be taken on a Study Tour to study civil engineering works and projects.

2. The Study Tour will be conducted during a vacation after completion of III year.

3. The duration of the Study Tour will be of two weeks.