

Tribhuvan University
Institute of Engineering



CURRICULUM

BACHELOR'S DEGREE IN ARCHITECTURE

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1. INTRODUCTION

The Institute of Engineering (IOE) is offering this course with the objective of producing high level technical manpower capable of undertaking works in the Architecture field. The details of the course are as follows:

1.1 Title of the Course

Bachelor in **Architecture**.

1.2 Duration of the Course

The total duration of the course is 5 years. Each year consists of two parts I and II, each part having duration of 90 working days (15 weeks).

2. COURSE STRUCTURE

The course is divided into 10 parts. The first year courses include fundamental common subjects. The second and third year generally include specific courses of the related discipline. The final year include professional and application type courses.

The course structure attached in the later section of this book provides information about lecture, tutorial and practical hours per week, full marks and pass marks for internal assessment and final examination, and the duration of final examination of each subject.

3. COURSE CODE

Each subject is specified by a unique code consisting of two letters followed by three digit number for core courses and five digit numbers for elective courses. The first two letters denote the department which offers the subject (SH: Science and Humanities, AE: Agricultural Engineering, AR: Architecture, CE: Civil Engineering, CT: Computer Engineering, EE: Electrical Engineering, EX: Electronics and Communication Engineering, GE: Geomatics Engineering, IE: Industrial Engineering, ME: Mechanical Engineering). The first digit of the number denotes the year on which the subject is offered (4 for first year, 5 for second year, 6 for third year and 7 for fourth year respectively for Bachelor' level course). The remaining two digits 01 to 49 are used for the core subjects offered in odd parts and 51 to 99 are used for the core subjects offered in even parts. Two extra digits from 01 to 99 are used for the elective courses.

Core Courses:

AB	DEF
----	-----

AB: Offering Department (SH, AE, AR, CE, CT, EE, EX, GE or ME)

D: Year (4 for first year, 5 for second year, and so on).

EF: 01- 49 for courses offered in odd parts and 51 to 99 for courses offered in even parts

Elective Courses:

AB	DEFGH
----	-------

GH: 01 to 99 specific numbers to each elective course

For example, ME 751 is the code for the core course “Finite Element Method” which is offered in fourth year first part by Department of Mechanical Engineering.

4. INSTRUCTION METHODS

The method of teaching is lectured augmented by tutorials and/or practical, whichever is relevant. Tutorials are used to enlarge and develop the topic and concepts stated in the lecture. Practical classes in the form of laboratory works and design/drawing practices are used to verify the concepts and to develop necessary basic skills. Each course is specified with certain lecture, tutorial and practical hour(s) per week. The hours specified as 3/2 in practical means 3 laboratory hours in each two weeks.

The use of multimedia and interactive mode (presentations) is encouraged for conducting fourth year courses.

5. INTERNAL ASSESSMENT AND FINAL EXAMINATION

The students' achievement in each subject is evaluated by internal assessment and final examination.

5.1 Internal Assessment

20 % of the total marks is allocated for internal assessment for theory part of all subjects. Internal assessment mark should include class performance, timely submissions and correctness of assignments, class tests, quizzes, etc.

Evaluation of practical part of most of the subjects is done through continuous assessment. It includes lab performance, report submission, presentation, viva etc. However, for few courses final examinations are also conducted.

70 % attendance is mandatory to qualify for the final examination.

5.2 Final Examination

Final examinations of 3 hours for theoretical subjects with full mark of 80 and 1.5 hours for theoretical subjects with full mark of 40 are conducted as per academic calendar of IOE.

5.3 Pass Marks

Any student must obtain 40 % in both internal assessment and final examination of each subject to pass in the subject. Only students who have passed the internal assessment of a particular subject are allowed to appear in the final examination of that subject..

6. EVALUATION SYSTEM

Students who have passed all the components of all subjects in all parts are considered to have successfully completed the course. The overall achievement of each student is measured by a final aggregate percentage which is obtained by providing a weight to percentages scored by the students in each part as prescribed below:

First year (both I and II Parts):	20 %
Second year (both I and II Parts):	20 %
Third year (both I and II Parts):	30 %
Fourth years (both I and II Parts):	30 %

Depending upon the final weighted aggregate percentage scored by a student, a division is awarded as follows:

80 % and above:	Distinction
65 % or above and below 80 %:	First
50 % or above and below 65%:	Second
40 % or above and below 50%:	Pass

B.E. DEGREE IN ARCHITECTURE

Year : I

Part : I

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duaration hours	Marks		Duaration hours	Marks		
1	SH 404	Engineering Mathmatics I	2	2		4	20	3	80				100	
2	CE 402	Applied Mechanics	3	2		5	20	3	80				100	
3	AR 401	Basic Design I	2		6	8				200			200	
4	AR 402	Introduction to Architecture	2			2	10	1.5	40				50	
5	AR 403	Building Materials I	2	2		4	20	3	80				100	
6	AR 404	Drafting I	1		3	4				100			100	
7	AR 405	Free Hand Sketching I			4	4				100			100	
Total			12	6	13	31	70	10.5	280	400			750	

B.E. DEGREE IN ARCHITECTURE

Year : I

Part : II

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duration hours	Marks		Duration hours	Marks		
1	SH 454	Engineering Mathmatics II	2	2		4	20	3	80				100	
2	AR 451	Drafting II	1		3	4				60	3	40	100	
3	AR 452	Basic Design II	2		6	8				200			200	
4	AR 453	Arts & Graphic	1		5	6				100			100	
5	AR 454	Building Construction I	2		2	4	10	1.5	40	50			100	
6	AR 455	Free Hand Sketching II			4	4				60	3	40	100	
7	CE 452	Basic Skill Workshop			4	4				50			50	
Total			8	2	24	34	30	4.5	120	520	6	80	750	

B.E. DEGREE IN ARCHITECTURE

Year : II

Part : I

S. N.	Course Code	Course Title	Teaching Schedule				Examination Scheme						Total	Remark
			L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duration hours	Marks		Duration hours	Marks		
1	AR 501	Design Studio III			10	10				300			300	
2	AR 502	History of Architecture I	4			4	20	3	80				100	
3	AR 503	Building Materials II	2	2		4	20	3	80				100	
4	AR 504	Building Construction II	2		2	4	10	1.5	40	50			100	
5	AR 505	Design Theory I	2	2		4	20	3	80				100	
6	AR 506	Building Science I	2		2	4	20	3	80				100	
7	CE 507	Structure I	2	1		3	20	3	80				100	
Total			14	5	14	33	110	16.5	440	350			900	

B.E. DEGREE IN ARCHITECTURE

Year : II

Part : II

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duration hours	Marks		Duration hours	Marks		
1	AR 551	Design Studio IV			10	10				300			300	
2	AR 552	History of Architecture II	4			4	20	3	80				100	
3	AR 554	Building Construction III	2		2	4	10	1.5	40	50			100	
4	AR 555	Design Theory II	3	1		4	20	3	80				100	
5	CE 557	Structure II	3	1		4	20	3	80				100	
6	CE 558	Surveying	4		4	8	20	3	80	50			150	
Total			16	2	16	34	90	13.5	360	400			850	

B.E. DEGREE IN ARCHITECTURE

Year : III

Part : I

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duration hours	Marks		Duration hours	Marks		
1	AR 601	Design Studio V			12	12				300			300	
2	AR 602	Contemporary Architecture	4			4	20	3	80				100	
3	AR 603	Computer Aided Design & Drafting			4	4				100			100	
4	AR 604	Building Construction IV	2		2	4	10	1.5	40	50			100	
5	AR 605	Working Drawing			6	6				100			100	
6	CE 607	Building Services I	2		2	4	10	1.5	40	50			100	
7	EE 604	Building Services II	2		2	4	10	1.5	40	25			75	
Total			10		28	38	50	7.5	200	625			875	

B.E. DEGREE IN ARCHITECTURE

Year : III

Part : II

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duaration hours	Marks		Duaration hours	Marks		
1	AR 651	Design Studio VI			12	12				300			300	
2	AR 652	Urban & Settlement Planning	4			4	20	3	80				100	
4	AR 654	Building Science II	3	1		4	20	3	80				100	
7	CE 657	Structure III	3	1		4	20	3	80				100	
5	CE 658	Specifications	2			2	10	1.5	40				50	
6	CE 659	Estimating & Costing	2		2	4	10	1.5	40	50			100	
8	SH 652	Sociology	2			2	10	1.5	40				50	
5	SH 653	Building Economics	2			2	10	1.5	40				50	
Total			18	2	14	34	100	15	400	350			850	

B.E. DEGREE IN ARCHITECTURE

Year : IV

Part : I

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duration hours	Marks		Duration hours	Marks		
1	AR 701	Practicum			30	30				100		200	300	
Total					30	30				100		200	300	

B.E. DEGREE IN ARCHITECTURE

Year : IV

Part : II

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final Duration hours	Final Marks	Assesment Marks	Final Duration hours	Final Marks		
1	AR 751	Architectural Conservation	4			4	20	3	80				100	
2	AR 752	Design Studio VII			12	12				300			300	
3	AR 753	Construction Management	4			4	20	3	80				100	
4	AR 765	Elective I	2		2	4	10	1.5	40	50			100	
6	SH 754	Communications (English & Nepali*)	2	1		3	10+5*	1.5+1.5	40+20*	15+10*			100	
7	CE 761	Structure IV	3	1		4	20	3	80				100	
8	ME 760	Building Services III	2		2	4	10	1.5	40	25			75	
Total			17	2	16	35	95	15	380	400			875	

B.E. DEGREE
IN
ARCHITECTURE

12	5
5	

Year : V

Part : I

Teaching Schedule							Examination Scheme						Total	Remark
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duaration hours	Marks		Duaration hours	Marks		
1	AR 801	Seminar & Directed Studies			4	4				100			100	
2	AR 802	Design Studio VIII			12	12				300			300	
3	AR 803	Landscape Design & Site Planning	2		2	4	10	3	40	50			100	
3	AR 805	Professional Practice	4			4	20	3	80				100	
4	AR 806	Thesis Proposal	1	2		3				150			150	
5	AR 825	Elective II	2		2	4	10	1.5	40	50			100	
Total			9	2	20	31	40	7.5	160	650			850	

B.E. DEGREE IN ARCHITECTURE

Year : V

Part : II

Teaching Schedule							Examination Scheme					Total	Remark	
S. N.	Course Code	Course Title	L	T	P	Total	Theory			Practical				
							Assesment Marks	Final		Assesment Marks	Final			
								Duaration hours	Marks		Duaration hours			Marks
1	AR851	Thesis			30	30				300		350	650	
Total			0	0	30	30	0	0	0	300	0	350	650	

ENGINEERING MATHEMATICS I

SH 404

Lecture : 2
Tutorial : 2

Year : 1
Part : I

Course Objectives:

To provide students a sound knowledge of calculus and analytic geometry to apply them in their relevant fields.

1. **Derivatives and its applications** (10 hours)
 - 1.1 Introduction
 - 1.2 Higher order derivatives
 - 1.3 Mean value theorem
 - 1.3.1 Roll's Theorem
 - 1.3.2 Lagrange's mean value theorem
 - 1.3.3 Cauchy's mean value theorem
 - 1.4 Indeterminate forms; L' Hospital rule
 - 1.5 Asymptotes to Cartesian and polar curves
 - 1.6 Pedal equations to Cartesian and polar curves; curvature and radius of curvature
2. **Integration and its Applications** (10 hours)
 - 2.1 Introduction
 - 2.2 Definite integrals and their properties
 - 2.3 Improper integrals
 - 2.4 Reduction formula; Beta Gama functions
 - 2.5 Application of integrals for finding areas, arc length, surface and solid of revolution in the plane for Cartesian and polar curves
3. **Plane Analytic Geometry** (5 hours)
 - 3.1 Transformation of coordinates: Translation and rotation
 - 3.2 Ellipse and hyperbola; Standard forms, tangent, and normal
 - 3.3 General equation of conics in Cartesian and polar forms
4. **Ordinary Differential and its Applications** (5 hours)
 - 4.1 First order and first degree differential equations
 - 4.2 Homogenous equations
 - 4.3 Linear equations
 - 4.4 Equations reducible to linear equations; Bernoulli's form
 - 4.5 First order and higher degree differential equation; Clairaut's form
 - 4.6 Second order and first degree linear differential equation with constant coefficients.

References:

1. Erwin Kreyszig, "Advance Engineering Mathematics" , John Wiley and Sons Inc
2. Thomas,Finney, "Calculus and Analytical Geometry" Addison- Wesley
3. M. B. Singh, B. C. Bajrachrya, "Differential Calculus", Sukunda Pustak Bhandar,Nepal
4. M. B. Singh, S. P. Shrestha, "Applied Mathematics", RTU, Department of Engineering Science and Humanities.
5. G.D. Pant, G. S. Shrestha, "Integral Calculus and Differential Equations", Sunila Prakashan, Nepal
6. M. R. Joshi, "Analytical Geometry", SukundaPustak Bhandar,Nepal
7. S. P. Shrestha, H. D. Chaudhary, P. R. Pokharel, "A Textbook of Engineering Mathematics - Vol I", Vidyarthi Pustak Bhandar.
8. Santosh Man Maskey, "Calculus", Ratna Pustak Bhandar, Nepal

APPLIED MECHANICS - STATICS AND DYNAMICS

CE 401

Lecture : 3
Tutorial : 2
Practical : 0

Year : I
Part : I

Course Objective :

To provide basic knowledge of engineering mechanics to the students of architecture so that it would be helpful for them to understand structural engineering analysis and design principles.

1. **Introduction** (2 hours)
 - 1.1 Differences of statics and dynamics in engineering mechanics
 - 1.2 Concept of rigid and deformed bodies
 - 1.3 Engineering mechanics for architects
2. **Basic Concept of Statics and Static Equilibrium** (4 hours)
 - 2.1 Concept of particle and free body diagram
 - 2.2 Physical meaning of equilibrium and its essence in structural application
 - 2.3 Equation of equilibrium in two dimensions
3. **Concept of Force Acting on Structures** (6 hours)
 - 3.1 Different types of forces: translational force and rotational force
 - 3.2 Resolution and composition of forces
 - 3.3 Principle of transmissibility and equivalent forces
 - 3.4 Moments and couples
 - 3.5 Resolution of a force into forces and a couple
 - 3.6 Resultant of force and moment for a system of force
4. **Center of Gravity, Centroid and Moment of Inertia** (6 hours)
 - 4.1 Concept of centre of gravity and centroid
 - 4.2 Calculation of second moment of area / Moment of inertia and radius of gyration
 - 4.3 Use of parallel axis theorem
5. **Friction** (2 hours)
 - 5.1 Laws of friction, static and dynamic coefficient of friction, Angle of friction
 - 5.2 Calculations involving friction in structures

- 6. Analysis of Beam and Frame** (9 hours)
- 6.1 Concept of loads and supports
 - 6.2 Concept of statically determinate and indeterminate beams and frames
 - 6.3 Calculation of axial force, shear force and bending moment for determinate beams and frames
 - 6.4 Nature of A.F.D., S.F.D. and B.M.D. and examples for drawing it
- 7. Analysis of Plane Trusses** (4 hours)
- 7.1 Use of steel trusses in architecture
 - 7.2 Calculation of member force of truss by method of joints: simple examples
- 8. Kinematics of Particles** (7 hours)
- 8.1 Rectilinear Kinematics: continuous motion
 - 8.2 Curvilinear motion: rectangular components
 - 8.3 Position, velocity and acceleration of a particle
 - 8.4 Determination of motion of particle
 - 8.5 Uniform rectilinear motion
 - 8.6 Uniformly accelerated rectilinear motion
 - 8.7 Projectile motion
 - 8.8 Motion Relative to a frame in translation
 - 8.9 Rectangular component of velocity and acceleration
- 9. Kinetics of Particles: Force and Acceleration** (5 hours)
- 9.1 Newton's second law of motion and momentum
 - 9.2 Equation of motion and dynamic equilibrium
 - 9.3 Angular momentum and rate of change
 - 9.4 Equation of motion-rectilinear and curvilinear
 - 9.5 Rectangular, tangential and normal components

Tutorials

1. There will be numerical from each chapter except chapter 1. Tutorials shall be exercised in classes at least one for each typical theories and sufficient number of exercises shall be given to the students as tutorials.

References:

1. R.C. Hibbeler, Ashok Gupta, "Engineering Mechanics-Statics and Dynamics", New Delhi, Pearson.
2. F.P. Beer and E.R. Johnston, Jr., "Mechanics of Engineers- Statics and Dynamics", Mc Graw-Hill.
3. I.C. Jong and B.G. Rogers, "Engineering Mechanics- Statics and Dynamics",

4. D.K. Anand and P.F. Cunnif, "Engineering Mechanics- Statics and Dynamics",
5. R.S. Khurmi, "A Text Book of Engineering Mechanics",
6. R.S.Khurmi, "Applied Mechanics and Strength of Materials",
7. I.B.Prasad, "A Text Book of Applied Mechanics",
8. Shame, I.H., "Engineering Mechanics-Statics and Dynamics", Prentice Hall of India, New Delhi.

BASIC DESIGN- 1

AR 401

Lecture : 2

Tutorial : 0

Practical : 6

Year : I

Part : I

Course Objective:

To explore fundamental principle and elements of design: form, space, composition and context and the solution to architectonic design projects through freehand sketch, drawings and models. To understand and use the basic equipments, media, techniques for communication. To introduce the process of architectural design and presentation.

1. Introduction

(4 hours)

The students will able to:

- 1.1 Understand about the subject and its contents for the semester.
- 1.2 Use drawing tools and to develop basic skill in scale free-hand drawings.

Exercises -1. (Drawings):

Drawing different types of lines and symbols.

Exercises-2.

Freehand sketch- class room exercise.

Exercises-3.

Scales- Definition, use and conversion. Exercise: Draw in scale plan, elevations and section of known objects e.g. class room furniture.

2. Defining Elements of design.

(10 hours)

The students will be able to:

- 2.1 Discover through exploration how primary elements of design like point, line, plane and volume to determine architectural form and space.
- 2.2 Recognise the contrast between two dimensional patterns and three dimensional volumes of space.
- 2.3 Discover through exploration how the volumes of solid and void organise space.
- 2.4 Develop the ability to select and define concept.
- 2.5 Consciously (deliberately) manipulate the architectural elements (floor, wall' ceiling, roof) to create spatial compositions.
- 2.6 Utilize model-making technique to produce study model and presentation model.

Exercise-1.

- a. Drawing exercises on point, line, plane and volume.
- b. Drawing exercises on transformation of form by additions and subtractions.

Exercise-2.

Design of an object by composing the planer elements and demonstrate how space, enclosure and structure can compliment each other to generate a form and to create a special effect when lit. Medium of communication will be the model.

E.g. Design of a lamp shed.

Exercise-3.

Design and draw three dimensional view of composition of spaces illustrating the combination of base plane, vertical planes and the overhead plane with at least three different options each.

Exercise-4.

Preparation of cardboard model of different volumes like cube, cone, pyramid cylinder etc.

3. Defining Principles of composition in Design. (16 hours)

The students will be able to:

- 3.1 Discover through exploration the basic principles of composition (Axis, Datum, Balance, Harmony, Rhythm, and Scale, Proportion etc.) to determine architectural form.
- 3.2 Recognise the contrast between two dimensional patterns and three dimensional volumes of space.
- 3.3 Discover through exploration how the volumes of solid and void organise space.
- 3.4 Develop the ability to select and define concept.
- 3.5 Consciously (deliberately) manipulate the architectural elements (floor, wall, ceiling and roof) to create spatial compositions.
- 3.6 Comprehend and apply the properties of form (shape, size, colour, texture, position, visual orientations etc. to create composition and express architectonic dialog.
- 3.7 Analyze, identify and respond to parameters and geometric properties of a given site/field.
- 3.8 Express the principles of dialog in three dimensional compositions and in their arrangements on a given site/ field.
- 3.9 Utilize model-making technique to produce study model and presentation model.

Exercise-1.

- a. Prepare a measured drawing of the class room.
- b. Prepare the alternate proposal for the class room with the manipulation

of floor plane, and the roof plane.

Exercise-2.

Prepare a composition of different volumes and be placed in a landscape site.

- ▣ Prepare a site model with simple contours.
- ▣ Re organise the contours.
- ▣ Fit the compositional model into the site.

Exercise-3.

Prepare a model of a high-rise building.

- ▣ Try to understand some of the principles composition applied on that.
- ▣ Try to develop skill of making presentation model.

References:

3. Ching Francis, "Architecture: Form, Space and Order"
4. Nelson, George, "How to See"
5. Laeau, Paul, "Graphic Thinking for Architects and Designers"
6. Hall, Edward, "The Hidden Dimension"
7. Sommer, Robert, "Personal Space"
8. Gibson, James, "The senses Considered as Perceptual System"

INTRODUCTION TO ARCHITECTURE

AR 402

Lecture : 2
Tutorial : 0
Practical : 0

Year : I
Part : I

Course Objective:

To introduce the field of architecture and its relation with society, culture, religion, technology and build environment, to understand the profession of architecture and its relation with allied profession, to understand the role of architecture in Nepal and the career opportunities scene.

1. The field of architecture brief survey from beginning of architecture to present times (2 hours)
2. The study of architecture and its features under TU. (1 hour)
3. Architecture, built environment and the society. (6 hours)
4. Socio-culture and religious context of architecture. (4 hours)
5. Technology and material context of architecture. (4 hours)
6. Site, City and ecological contest of architecture. (2 hours)
7. The architecture profession and its interactive relationship with allied professionals such as planners, engineers, interior designers, landscape architects etc. (4 hours)
8. The profession of architecture of Nepal-its practice both public and private, career opportunities. (2 hours)
9. Architect, client and contractor, planning and building controls in force. (5 hours)

BUILDING MATERIALS I

AR 403

Lecture : 2

Year : I

Tutorial : 2

Part : I

Practical : 0

Course Objective :

To have knowledge of different building materials, develop understanding of properties, quality and uses of materials and their testing methods to determine their qualities.

1. Introduction**(1 hour)**

Building Materials & its importance in architecture and engineering. Objective of Building material study.

2. Stone**(10 hours)**

2.1 Introduction

Building material available in Nepal

2.2 Sources of Stone

2.2.1 General knowledge of types of rocks according to geological formation

2.2.1.1 Igneous rock

2.2.1.2 Sedimentary rock

2.2.1.3 Metamorphic rock

2.2.2 Types of rocks by physical properties

2.2.3 Types of rocks by hardness

2.3 Quarrying of Stone

2.3.1 Types of quarrying

i) Quarry by hand

ii) Quarry by machine

iii) Quarry by blasts

2.4 Seasoning and preservation of stone

2.5 Dressing of Stone

2.5.1 Hammer dressing

2.5.2 Chisel drafted margin

2.5.3 Tooling and axing

2.5.4 Fine tooling

2.5.5 Rubbed and polished work

2.6 Stone Masonry

2.6.1 Types

2.6.2 General principles to be observed in the construction

2.6.3 Comparison between Brick and Stone Masonry

2.7 Selection and uses of Stone for Engineering and Architectural Works: Granite, Sandstone, Limestone, Marble & Slate.

- 3. Brick :** (6 hours)
- 3.1 Introduction, Constituents of Brick, Sizes of Brick
 - 3.1.1 Brick Making Process
 - 3.1.2 Hand making process
 - 3.1.3 Machine making process
 - 3.2 Characteristics of Good Bricks & Sizes
 - A class Brick
 - B class Brick
 - C class Brick
 - 3.3 Testing of Brick
 - 3.3.1 Water absorption test
 - 3.3.2 Sandiness test
 - 3.3.3 Compressor strength test
 - 3.3.4 Tensile strength test
- 4. Lime :** (2 hours)
- 4.1 Introduction, Constituents of lime
 - 4.2 Classification of lime
 - 4.3 Comparison between different types of lime
 - 4.4 Uses -Lime plaster, lime punning, lime painting
- 5. Cement:** (12 hours)
- 5.1 Introduction, constituents of cement
 - 5.2 Properties
 - 5.3 Manufacturing process of cement.
 - a) Mixing
 - b) Burning
 - c) Grinding
 - 5.3.1 Dry process (Flow chart diagram)
 - 5.3.2 Wet process
 - 5.4 Testing of Cement
 - 5.4.1 Fineness
 - 5.4.2 Soundness
 - 5.4.3 Tensile strength
 - 5.4.4 Compressive strength
 - 5.4.5 Test for chemical composition
 - 5.4.6 Rough and ready method of examining cement
 - 5.5 Properties of Cement Mortar, types & uses.
 - 5.5.1 Cement plaster
 - 5.5.2 Cement paints
 - 5.6 Storage of Cement
- 6. Sand:** (3 hours)
- 6.1 Introduction as building material
 - 6.2 Classification and uses of sand
 - 6.3 Bulking of sand

- 6.4 Characteristics of good sand
- 6.5 Substitutes of sand

7. Concrete: (12 hours)

- 7.1 Introduction and constituents & mixture ratios
- 7.2 Aggregates
 - 7.2.1 Fine aggregates-Sand, Stone Screening
 - 7.2.2 Coarse aggregates derived from rocks, bricks, slag & pebbles
- 7.3 Water – Quality, Water Cement Ratio
- 7.4 Workability of Concrete, Slump Test
- 7.5 Concrete Mixing – Hand mixing, Machine Mixing & Batch Mixing
- 7.6 Transportation & Placing of concrete
- 7.7 Compacting of Concrete
- 7.8 Curing of Concrete
- 7.9 Reinforced Cement Concrete
- 7.10 Concrete Admixtures & water proofing

8. Field Works: (14 hours)

- 8.1 Visit to ongoing project site
- 8.2 Market survey of different building materials
- 8.3 Tensile and compressive strength test of concretes

Evaluation Scheme:

The questions will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below:

References:

- 1. Gurucharan, "Building Materials"
- 2. Sushil Kumar, "Building Materials"

DRAFTING – I

AR 404

Lecture : 1
 Tutorial : 0
 Practical : 3

Year : I
 Part : I

Course Objective:

To familiarize with the use of drafting instrument and introduce drawings by the exercises through the concepts and principles of orthographic and parallel projection to develop drafting skill.

1. **Preliminary drawing skill:** (6 hours)
 - 1.1 Introduction of drawing and its classification: Artistic drawing, engineering drawing, Geometrical drawing: a) Plane geometrical drawing, b) Solid geometrical drawing, Architectural, Civil, Computer, Electrical, Electronics and Mechanical drawings.
 - 1.2 Drafting equipments and their use, importance of accuracy, drawing sheet format and layout of drawing sheet etc.
 - 1.3 Skill development practice in drafting: Different types of line, line weights etc.; convention for lines, materials and features, texture of different materials.
 - 1.4 Lettering and its types: Proportional base, style base & stroke and direction base.
 - 1.5 Scale and dimensioning: Its types and systems.
 - 1.6 Reproduction of geometrical and building drawings at different scales.
 - 1.7 Geometrical drawings: Point, line bisection, perpendicular line, parallel line, trisection of line, bisection of angle, trisection of angle etc.
 - 1.8 Inscribing and describing of circle about a triangle, square and polygon etc.
 - 1.9 Construction of square, different types of polygons, external and internal tangents, arc tangents, special curves, conical sections and other geometrical constructions.
 - 1.10 Tracing in pencil & ink medium.

2. **Theory of Projection:** (1 hours)
 - 2.1 Introduction
 - 2.2 Types of projection: a) Orthographic projection, b) Pictorial projection.
 - 2.3 Pictorial projection: a) Axonometric, b) Oblique, and c) Perspective.

3. **Orthographic Projection (2D drawing):** (3 hours)
 - 3.1 Introduction
 - 3.2 System of three planes
 - 3.3 Principles of orthographic projection
 - 3.4 Projection of point in different planes

- 3.5 Projection of lines of different position in relation to the projection planes
 - 3.6 Projection of rectangular surfaces of different position in relation to the projection planes
 - 3.7 Projection of solids (cube, hexagonal prism, cylinder, cone, pentagonal pyramid and sphere) in different projection planes
 - 3.8 Projection of point and lines on the surface of solid figures
 - 3.9 Projection of three dimensional objects in different planes (conversion of isometric views into orthographic projection)
- 4. Pictorial Projection (3D drawing): (2 hours)**
- 4.1 Isometric Projection: Isometric scale, isometric axes, isometric lines, non-isometric lines, isometric planes
 - 4.2 Conversion of orthographic views into isometric projection and drawing
 - 4.3 Conversion of geometrical and architectural drawing into axonometric projection 45o - 45o, 30o - 60o (Metric projection)
- 5. Different views sections and surfaces: (3 hours)**
- 5.1 Auxiliary views and its type and projection
 - 5.2 Sectional views and its types and projection (section of solids)
 - 5.3 Intersection of surfaces and its methods of projection
 - 5.4 Development of surfaces and its methods of projection

PRACTICAL:

(Detail of Practical exercises/sheets to be completed by students and marks for each assignment).

S.N.	Title	Qty.	Hour	Total Marks
1.	Name plate with border line & hatching line.	1	18	
2.	Formation of lines.	1		
3.	Different types of lettering on proportional base.	1		
4.	Convection for lines, materials and textures.	2		
5.	Exercises on different scales of geometrical figures and building drawings.	1		
6.	Exercises on different system of dimensions of geometrical figures and building drawings.	1		
7.	Exercises on geometrical construction of point, line bisection, perpendicular line, parallel line, trisection of line, bisection and trisection of angle etc.	2		
8.	Exercises on inscribing and describing of circle about a triangle, square and polygon etc.	2		
9.	Exercises on construction of square, different types of polygons, external and internal tangents, arc tangents, special curves, conical sections and other geometrical constructions if needed.	2		
10.	Exercises on tracing of geometrical and building drawings in pencil and ink medium.	1		
11.	Exercises on orthographic and pictorial and planes in 1st and 3rd angle projection.	2	12	
12.	Exercises on orthographic and pictorial projection of solid figures.	2		
13.	Exercises on orthographic projection of point and lines on the surface of solid figures.	1		
14.	Exercises on orthographic projection of three dimensional figures in 1st and 3rd angle projection. (Conversion of isometric drawing into orthographic projection.)	1		
15.	Exercises on isometric drawing and projection of different types of block models in 1st angle projection and 3rd angle projection if needed. (Conversion of orthographic views into isometric drawings.)	2	6	
16.	Exercises on axonometric projections (45o - 45o, 30o - 60o) of geometrical and building drawings.	2		

17.	Exercises on auxiliary types of view.	1	9	
18.	Exercises on sectional type of view.	2		
19.	Exercises on orthographic projection of different types of section of Geometric solids.	6		
20.	Exercise on orthographic projection of intersection or interpenetration of different solids (prism by prism, cylinder by cylinder, cone by cylinder, cone by prism and others if needed).	1		
21.	Exercises on development of surfaces of different solids. (Cube, prism, cylinder, cone, pyramid, sphere and other if needed.)	2		
Total		36	45	80
Internal Assessment (4 hours)		-	-	20
Grand Total		-	-	100

Reference:

1. D.K.Ching, "Architectural Graphics"
2. R.K. Dhawan "A Text Book of Engineering Drawing"
3. K. Venugopal "Engineering Drawing & Graphics"
4. N.D. Bhatt & V.M. Panchal, "Engineering Drawing (Plane & Solid Geometry)"
5. Warren J. Luzadder and Jon M. Duff, "Fundamentals of Engineering Drawing"
6. F.E. Giescke, A. Mitchell, and others, "Technical Drawing"
7. T.E. French, C.J. Vierck and R.J. Foster, "Engineering Drawing Graphic Technology"

FREE HAND SKETCHING-1

AR 405

Lecture : 0

Tutorial : 0

Practical : 4

Year : I

Part : I

Course Objective:

To impart Knowledge & skill of free hand sketching with free hand perspective, basic exercises in color, pencil, pen, brush etc.

1. **Introduction** (4 hours)
 - 1.1 History of Free Hand sketching, (Drawing) with preference to Architecture.
 - 1.2 Relevance of Free Hand sketching in Architecture design.
 - 1.3 General knowledge of sketching materials as pencil, paper, color, brush, pen etc.
2. **Basic principle of Free Hand sketching.** (4 hours)
 - 2.1 Formal, Informal balance, Rhythm, Harmony, contrast, gradation, etc.
 - 2.2 Shade & shadow
3. **Practices in free hand sketching** (8 hours)
 - 3.1 Line exercise in pencil, color & ink (straight, curve, zigzag etc.)
 - 3.2 Tone exercise pencil, color & ink (tint & tones)
 - 3.3 Texture exercise in pencil, color & ink
 - 3.4 Pencil, pen, color exercise
4. **Free hand sketching of still life in studio condition:** (12 hours)
 - 4.1 Free hand sketching of still life in studio of simple objects in pencil, ink & color
 - 4.1.1 Nature objects – flower & fruit
 - 4.1.2 Man made objects – cube /sphere/ pyramid/ cuboids
 - 4.2 Free hand sketching of still life in studio of complex objects in pencil, ink & color
 - 4.2.1 Nature objects - combination of flower & fruit
 - 4.2.2 Man made objects - combination of solid objects (cube / sphere / pyramid / cuboids)
5. **Free hand sketching of tree, door & window (classical) in pencil, ink, color** (4 hours)
6. **Free hand fast sketching (pencil only)** (12 hours)
 - 6.1 Different objects (Tree, human figures, vehicles, perspective views, cloud, furniture, etc) in indoor and outdoor.

7. Application of different mediums as pencil, color, pen in interior & exterior (8 hours)
8. Class Test (4 hours)
9. Review, consultation & submission (4 hours)

References:

1. Bernard Durstan , "Starting to Paint Still Life"
2. Leon Franks, " How to do Still Life"
3. Prof. S.K. Luthra, "Applied Art Handbook"
4. Herbert Parrish, "Flower and Still Life"
5. Ray Smith, "The Artists Hand Book"

ENGINEERING MATHEMATICS II

SH 454

Lecture : 2

Year : 1

Tutorial : 2

Part : II

Course Objectives:

To develop the skill of solving differential equations; to provide knowledge of vector algebra and calculus; to make students familiar with calculus of several variables and infinite series

1. **Vector Algebra and Calculus** (5 hours)
 - 1.1 Introduction
 - 1.2 Two and three dimensional vectors
 - 1.3 Scalar products and vector products
 - 1.4 Reciprocal System of vectors
 - 1.5 Application of vectors: Lines and planes
 - 1.6 Scalar and vector fields
 - 1.7 Derivatives – Velocity and acceleration
 - 1.8 Directional derivatives

2. **Multiple Integrals** (5 hours)
 - 2.1 Introduction
 - 2.2 Double integrals in Cartesian and polar form; change of order of integration
 - 2.3 Area and volume using double integrals

3. **Three Dimensional Solid Geometry** (10 hours)
 - 3.1 The straight line; Symmetric and general form
 - 3.2 Coplanar lines
 - 3.3 Shortest distance
 - 3.4 Sphere
 - 3.5 Plane Section of a sphere by planes
 - 3.6 Tangent Planes and lines to the spheres
 - 3.7 Cone; Right circular cone
 - 3.8 Cylinder; Right circular cylinder

4. **Calculus of two or more Variables** (5 hours)
 - 4.1 Introduction: limit and continuity
 - 4.2 Partial derivatives
 - 4.2.1 Homogeneous function, Euler's theorem for the function of two variables
 - 4.2.2 Total derivatives
 - 4.3 Extreme of functions of two and three variables; Lagrange's Multiplier

5. Infinite Series**(5 hours)**

- 5.1 Introduction
- 5.2 Series with positives terms
- 5.3 convergence and divergence
- 5.4 Alternating series. Absolute convergence
- 5.5 Radius and interval of convergence

References:

1. Erwin Kreyszig, "Advanced Engineering Mathematics ", John Wiley and Sons Inc.
2. Thomas, Finney, "Calculus and Analytical Geometry", Addison- Wesley
3. M. B. Singh, B. C. Bajrachrya, "Differential Calculus", Sukunda Pustak Bhandar, Nepal
4. M. B. Singh, B. C. Bajrachrya, "A Text Book of Vectors", Sukunda Pustak Bhandar, Nepal
5. M. B. Singh, S. P. Shrestha, "Applied Engineering Mathematics", RTU, Department of Engineering Science and Humanities.
6. G.D. Pant, G. S. Shrestha, "Integral Calculus and Differential Equations", Sunila Prakashan, Nepal
7. Y. R. Sthapit, B. C. Bajrachrya, "A Text Book of Three Dimensional Geometry", Sukunda Pustak Bhandar, Nepal
8. Santosh Man Maskey, "Calculus", Ratna Pustak Bhandar, Nepal

DRAFTING - II

AR 451

Lecture : 1
Tutorial : 0
Practical : 3

Year : I
Part : II

Course Objective:

To introduce drawings with basic fundamental exercises through the concepts and principles of perspective projection, and sciagraphy.

- 1. Perspective Projection: (9 hours)**
 - 1.1 Introduction, terms of perspective.
 - 1.2 Types of Perspective: One point, two point & three point.
 - 1.3 Views of perspective projection: Normal eye view, bird's eye view and worm's eye view..
 - 1.4 Principles of one point and two point perspective view.
 - 1.5 Its importance and use.
 - 1.6 Difference between isometric views and perspective drawing.
 - 1.7 Various exercises in perspective projection from geometrical to architectural drawings.
 - 1.8 Application of perspective projection in geometrical and architectural drawings.

- 2. Sciagraphy: (6 hours)**
 - 2.1 Introduction - Terms of sciagraphy.
 - 2.2 Types of source of light: Natural and artificial.
 - 2.3 Principles of sciagraphy.
 - 2.4 Its importance and use.
 - 2.5 Types of shadows in orthographic, parallel and perspective projections.
 - 2.6 Various exercises in sciagraphy from design element to architectural drawings.
 - 2.7 Application of sciagraphy in geometrical and architectural drawings.

PRACTICAL:

(Detail of Practical exercises/sheets to be completed by students and marks for each assignment)

S.N.	Title	Qty.	Hour	Total Marks
1.	Introductory sheet of one point and two point perspective projection.	1	27	
2.	Types of one point and two point perspective projection.	1		
3.	Effect of change of station point.	1		
4.	Effect of change of plan angle.	1		
5.	Effect of change of picture plane.	1		
6.	Effect of change of horizon line.	1		
7.	Exercise on detail method of one pt. and two pt. perspective projection.	1		
8.	Exercise on two combined blocks in two point perspective projection.	1		
9.	Exercise on three combined blocks in two point perspective projection.	1		
10.	Exercise on two point perspective projection of a complex figure.	1		
11.	Exercise on one point perspective projection of a room interior including roof projection, points in floor and ceiling and openings etc.	1		
12.	Exercise on one point perspective projection of a room with floor tiling and furniture block layout.	1		
13.	Exercise on one point perspective projection of a room with detail furniture layout.	1		
14.	Exercise on two point perspective of building elements such as steps, roof projections (flat and slope), openings (rectilinear and arched).	1		
15.	Exercise on two-point landscape perspective projection with simple residence.	1		
16.	Exercise on sectional perspective projection of a simple residence with furniture layout.	1		
17.	Exercise on two point perspective projection of a simple residence with surroundings (landscape).	1		

S.N.	Title	Qty.	Hour	Total Marks
18.	Introductory pictorial sheet of sciagraphy.	1	18	
19.	Exercise on sciagraphy projection of point, lines and planes.	1		
20.	Exercise on sciagraphy projection of solid figures.	1		
21.	Exercise on sciagraphy projection of walls into wall plane.	1		
22.	Exercise on sciagraphy projection of roof overhang into wall plane.	1		
23.	Exercise on sciagraphy projection of walls and roof overhangs into ground.	1		
24.	Exercise on sciagraphy projection of colonnades and arches into wall and ground planes.	1		
25.	Exercise on sciagraphy projection of different steps.	1		
26.	Exercise on sciagraphy projection of chimney stacks and dormer window in pitched roof (slope roof).	1		
27.	Exercise on sciagraphy projection of a small residence having roof overhang, wall projection and steps with landscape elements etc.	1		
28.	Exercise on sciagraphy projection of a set of simple residence (Elevations, roof, plans, site plan, etc.).	1		
Total		28	45	50
Internal Assessment		-	-	10
Grand Total		-	-	60

References:

1. D.K.Ching, "Architectural Graphics"
2. Robert W. Gill, "Rendering with Pen and Ink"
3. Robert W. Gill, "Basic Rendering"
4. Nicholas T. Dines, "Landscape Perspective Drawing"
5. Design and Drawing with Confidence.
6. Architecture for Everyone.

BASIC DESIGN - II

AR 452

Lecture : 2
 Tutorial : 0
 Practical : 6

Year : I
 Part : II

Course Objective:

To explore further from understanding the fundamental principles and elements of design to the development of skill in solving composite problem which includes different functions, circulation and construction system related to building design. To understand the development of design with respect to natural light, ventilation and service system. To introduce the use of perception in creative design. To employ the above process for the solution of architectural design and to present through freehand sketches, drawings and models.

1. Understanding of Design Standards. (6 hours.)

The students will able to:

- Understand and investigate the measurement of human figure and their movements in space.
- Refer different data sources and standards
- Explore how the basic knowledge of anthropometry is being utilize in building design.
- Consider the use of light, ventilation and services system.

Exercises-1. (Group work).

- a. Library research on Anthropometry and Anthropometric data with reference to international design standards.
- b. Compare and develop the anthropometric data based on Nepalese context.

Exercises-2.

Application of knowledge of anthropometric data to building program formulation through the study of different activities. Introduction of idea of using natural light and ventilation.

e.g. Design of own bed room with an attached bathroom.

2. Understanding of visual perception and transformations of forms. (10 hours)

The students will able to:

- To get inspiration from the natural object.
- Understand how the perception changes with the change of colour, background and so on.
- Transformation of one form and shape to another to create different perceptions.

- To develop ability to design with the inspiration from nature.
- Develop further skill on freehand sketch, colouring and model making with the creative use of different materials.

Exercises-1.

Make three dimensional sketch of any natural object and transform its shape and form to the level of abstraction by changing colours, reversing the colour of object and background, manipulating existing mass and void textures and grains etc. Presentation in the form of poster by composing series of sketches of transformation.

Exercises-2.

Make a three dimensional model from the final sketch with innovative use of materials.

3. Developing abilities to formulate building program to design of architectural space and composition. (14 hours)

The students will able to: (utilise most of the knowledge from previous exercises).

- To explore how the basic knowledge of anthropometry is being utilise in building design.
- To refer different data sources and the standards.
- Discover through exploration of basic principles of design to apply in own design exercise.
- Consciously (deliberately) manipulate the organisation of architectural elements like Door, walls, roof etc to create spatial composition of relative complexity.
- Communicate explicitly in words, drawings and diagrams the concept of design and the knowledge gained from the case studies.
- Discover through analysis of interrelationship between the architectural composition and the context (site).

Exercises-1. (Group work)

Application of the knowledge of anthropometric data to building design through Case- Studies e.g. residences, restaurants, bookshops, showrooms, city service centres etc.

Exercises-2.

Building design of the similar building of their case study in a given site.

References:

1. Ching Francis, "Architecture: Form, Space and Order"
2. Nelson, George, "How to See"
3. Laeau, Paul, "Graphic Thinking for Architects and Designers"
4. Hall, Edward, "The Hidden Dimension"
5. Sommer, Robert, "Personal Space"
6. Gibson, James, "The senses Considered as Perceptual System"
7. Chiara J. De and Callender J, "Time Savers Standards, Building Types"

ARTS & GRAPHIC

AR 453

Lecture : 1
 Tutorial : 0
 Practical : 5

Year : I
 Part : II

Course Objective:

To introduce fundamental of architectural elements and forms, geometrical forms, principles of composition, three dimensional composition, color application and presentational techniques in architectural drawing and understanding architectural graphics as a means of visual communication.

1. **Scope of study and its importance:** (2 hours)
 - 1.1 Arts and drawings as a means to communicate ideas, and graphic thinking.
 - 1.2 Elements and Forms (Points, line, plane, solid, natural and man-made artifacts, geometrical forms and objects)

2. **Interpenetration of different forms:** (2 hours)
 - 2.1 Prismatic, pyramidal, cylindrical & conical forms
 - 2.2 Spherical & other forms
 - 2.3 Building design forms

3. **Basic principles and Composition:** (2 hours)
 - 3.1 Tone (Bright and dull tone, tonal value, high, medium and dark)
 - 3.2 Texture / Pencils HB, H, B (use and stress)
 - 3.3 Compositional development of presentation (Texture, tree, bushes/ shrubs, human figure, vehicles and clouds etc.)
 - 3.4 Composition (Balance, Rhythm, Scale, Unity, Harmony, Contrast, Monotony, Focal point, Hierarchy etc.

4. **Color theory & its applications:** (3 hours)
 - 4.1 Color (Color scheme, color wheel and its properties, uses and effects etc.)
 - 4.2 Use of color in architectural buildings (Exterior and Interior)
 - 4.3 Composition of collage, CD cover, magazine cover in different visual media and techniques

5. **Architectural rendering development skill in different mediums:** (2 hours)
 - 5.1 5.1 Rendering in architectural building (Exterior)
 - 5.2 5.2 Rendering in architectural building (Interior)

6. Preparation of a set of presentational drawings of a simple Building using appropriate rendering techniques: (4 hours)

- 6.1 Floor Plans including furniture layout.
- 6.2 Elevations
- 6.3 Sections
- 6.4 Site Plan
- 6.5 Shadow construction in plans and elevations
- 6.6 Perspective drawing (Exterior & Interior)

PRACTICAL:

(Detail of Practical exercises/sheets to be completed by students and marks for each assignment).

S.N.	Title	Qty.	Hour	Total Marks
1.	Introductory sheet of art and drawing sketch.	1	6	
2.	Exercise of solid forms.	1 + 1		
3.	Exercise in man-made, natural and geometrical objects.	1		
4.	Exercises in interpenetration of geometrical forms (a) Prismatic and pyramidal forms (b) Cylinder and conical forms (c) Spherical and other forms (d) Design bldg. form	1 1 1 1	10	
5.	Exercise on basic principle and composition using compositional properties based on model making.	1 Model	12	
6.	Exercise on tonal chart.	1 + 1		
7.	Exercise on textures.	1		
8.	Exercise on entourage like trees, human figures, vehicles, water bodies, ground, walkways, road way and cloud etc.			
	(a) Trees: 2D trees in different size & type (top view, front view etc.) 3D sketches of trees	1		
	(b) Human figures: (Standing, sitting, moving, single, dual and group of people with different activities in different scales)	1		
	(c) Vehicle: Method of drawing vehicle using box method, different designs and directional movement in different scales)	1		
	(d) Water bodies, ground, background hatching, walk way, road way and cloud etc.	1		
9.	Exercise on 2D/3D compositions			
	(a) Collage/ Mural (b) C.D. cover or magazine cover	1 1		

10.	Exercise on color (a) Color wheel: Prang system of color (12 Nos.) : Munsell system of color (10 Nos.) : Classical system of color with intermediate color (b) Related color scheme (c) Contrast color scheme (d) Neutral color scheme (e) Tint and Tone	1 1 1 1 1	16	
11.	Exercises on rendering techniques in different mediums (Pencil, water color and pen and ink) (a) Building elevations plans (b) Building plan with furniture layout/sectional plan (c) Site plan/Landscape	1 1 1	10	
12.	Delineate a set of simple residence with shadow construction (sciagraphy) in different medium.	1	18	
13.	Delineate a perspective view (angular exterior view) of a set of simple residence in any medium	1		
14.	Delineate an interior perspective view (parallel perspective) of living space of a simple building in any medium including flooring, furnishing and fixtures.	1		
Total		30	72	80
Internal Assessment		-	-	20
Grand Total		-	-	100

References:

1. D.K.Ching, "Architectural Graphics"
2. Michael E. Doyle, "Colour Drawing"
3. Robert W. Gill, "Rendering with Pen & Ink"
4. Robert W. Gill, "Rendering"
5. Graphic Thinking for Architects and Designers.
6. O. Halse, "Rendering Techniques"
7. Design and Drawings with Confidence
8. Architecture for Everyone.
9. Mrs. Madhura Karki, "Graphic and Presentation (Lab Manual)"
10. Mrs. Madhura Karki, "Arts and Graphic (Lab Manual)"
11. From line to Plan.

BUILDING CONSTRUCTION I

AR 454

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : I
 Part : II

Course Objectives:

To familiarize with Building Construction techniques, building components - Foundation, Superstructure and roofs. Field examples are often made and students are encouraged to make field visits

Course Details:

1. **Introduction** (1 hour)
 Introduction to course, why construction techniques are important vis a vis building designing and working drawings. How it relates to others subjects in structure drawings. How does building construction assist in implementation of design outputs. Why are guidelines adopted in construction. Run the outlines of the course time.
2. **Site Works and Setting Out:** (2 hours)
 - 2.1 Commencement, preconstruction of work vis possession of site
 - 2.2 Clearing of site & building layout.
3. **Excavation: Requirement for excavation** (1hour)
4. **Timbering in Trenches:** (2 hours)
 - 4.1 Timbering in shallow foundations in hard soil to loose soil
 - 4.2 Timbering in shallow foundations in water logged soil
5. **Foundations and their types:** (6 hours)
 - 5.1 Types, functions, characteristics
 - 5.2 Selection of foundations, viz. strip, pad, combined, balanced, cantilever and raft foundations
 - 5.3 Deep foundation types as per distribution of load and materials for construction
 - 5.4 Types of materials used in construction of piles.
6. **Soil investigation:** (4 hours)
 - 6.1 Introduction to soil types and thier characteristics
 - 6.2 Site exploration, method of calculating bearing capacity.
 - 6.3 Foundations in weak soil with reference to black cotton soil,
 - 6.4 Improvement of soil bearing capacities
 - 6.4.1 Improvement of sub soil drainage viz group water drains,
 - 6.4.2 Materials and drainage layout.

- 7. **Damp Protection:** (4 hours)
 - 7.1 Moisture movement in building
 - 7.2 Sources and cause of dampness, defects of dampness;
 - 7.3 Methods of damp proofing, damp proof courses, materials used for damp protections,
 - 7.4 Selection of appropriate DPC materials for different parts of building.

- 8. **Floor Structures :** (4 hours)
 - 8.1 Introduction to floors, types and materials of construction
 - 8.2 Ground floors
 - 8.3 Upper floors
 - 8.4 Timber floors
 - 8.5 RCC floors
 - 8.6 Floor finishes

- 9. **Masonry wall:** (4 hours)
 - 9.1 Introduction to wall types, materials and mortars used
 - 9.2 Stone masonry,
 - 9.3 Brick masonry.
 - 9.4 Concrete block masonry

- 10. **Openings in Walls:** (2 hours)
 - 10.1 Lintels, Arches & their types
 - 10.2 Materials of construction.

Practical Assignments:

S. No	Units	Hours	No. of Sheets	Marks Distribution
1	2,	2	1	
2	4	4	2	
3	5	4	2	
4	7	2	1	
5	8	8	4	
6	9	4	2	
7	10	4	2	
Total		28	14	50

References:

1. R. Barry, "The Construction of Buildings: Volumes 1 – 5"
2. R. Chudley, "Construction Technology, Volumes 1 – 4"
3. Chung, " Building Construction Illustrated"
4. Hans Banz, "Building Construction Details (Practical Drawings)",
5. Sushil Kumar, " Building Construction"

6. Gurcharan Singh, " Building Construction and Materials"
7. Rangawala, " Building Construction"
8. P. C. Varghese, " Building Construction"
9. WB Mackay, " Building Construction"
10. Mitchell, "Building Construction"

FREE HAND SKETCHING-II

AR 455

Lecture : 0
 Tutorial : 0
 Practical : 4

Year : I
 Part : II

Course Objective:

To impart Knowledge & develop skill of free hand sketching with free hand perspective and basic exercise of color, pencil, pen, brush etc.

1. **Introduction to advanced free hand sketching skill (interior, exterior & landscape) (8 hours)**
 - 1.1 Exercises of tone, shade & shadow by pencil, color, pen in different objects
2. **Free hand sketching of interior space (8 hours)**
 - 2.1 Free hand sketching of interior space of historical environment by the following techniques
 - 2.1.1 Pencil
 - 2.1.2 Ink
 - 2.1.3 Color
 - 2.2 Free hand sketching of interior space of modern Architecture environment by
 - 2.2.1 Pencil
 - 2.2.2 Ink
 - 2.2.3 Color
3. **Free hand sketching of exterior space (8 hours)**
 - 3.1 Free hand sketching of exterior space of historical architecture environment by
 - 3.1.1 Pencil
 - 3.1.2 Ink
 - 3.1.3 Color
 - 3.2 Free hand sketching of exterior space of modern architecture environment by
 - 3.2.1 Pencil
 - 3.2.2 Ink
 - 3.2.3 Color
4. **Free hand fast sketching (by color) of different objects – human figures, tree, vehicles, furniture, perspective views, clouds, etc (16 hours)**
5. **Free hand sketching of landscape by color (4 hours)**

6. Introduction of anatomy

- 6.1 Simple Pencil fast sketching of different parts of human figure (live & gypsum) (8 hours)
 - 6.1.1 Gypsum bodies (eye, lips, ear, nose, hand, foot, head etc.)
 - 6.1.2 Live full figure (male & female)
- 6.2 Self portrait by pencil (4 hours)

7. Review, consultation & submission (4 hours)**Course Objective:**

To impart Knowledge & develop skill of free hand sketching with free hand perspective and basic exercise of color, pencil, pen, brush etc.

References:

1. Bernard Atkins , "Architectural Rendering"
2. Walter Foster - "Anatomy"
3. Walter Foster, "Figures from Life"
4. Stella Maekie, "Portraits and How to do them"
5. Victor Perard, "Anatomy and Draining"
6. Robert Wood, " Landscape and Seascapes"
7. John Fernandish, "Illustration"

BASIC SKILLS WORKSHOP

CE 452

Lecture : 0

Tutorial : 0

Practical : 4

Year : I

Part : II

Course Objective:

- To gain basic knowledge in woodwork technology
- To develop skills in using hand tools and equipment
- To develop basic skills for model making and structural systems in architectural design
- To identify joinery works and different types of joints used in structural components of a structure
- To gain basic manipulated skills and achieve carpentry techniques in carpentry/joinery work trade

1. **Shop Exercises** (8 hours)
 - 1.1 Sharpening a plane iron using and oil stone
 - 1.2 Dismantling, assembling and adjusting a plane
 - 1.3 Planning a timber piece by hand using hand tool, to produce a face side
2. **Develop manipulative skills in using machines** (12 hours)
 - 2.1 Parallel saw (cross cutting saw)
 - 2.2 Circular saw. Function, types & component part and assembling
 - 2.3 Hand feed planner & surfacer (Identification & use only)
3. **Exercise on making lap dove tail joint** (8 hours)
4. **Exercise on mortise & tenon joints** (8 hours)
5. **Exercise on cross halved joints** (12 hours)
6. **Exercise on painting and varnishing** (12 hours)

DESIGN STUDIO III

AR 501

Lecture : 0
 Tutorial : 0
 Practical : 10

Year : II
 Part : I

Course Objective:

- To understand integration visual communication with design process.
- To understand nature of built environment, space and human scale through investigation & analysis
- To programming and design synthesis into built form.

EXERCISES:

Exercise No. /Hours	Suggested Project	Content of submission	Marks Distribution
72 Hours	Single Family Residential House (Load bearing structure, not exceeding 2 storey)	Site Plan, Plans, Section, Elevations, Furniture Layout, Perspective Drawing, Block Model.	120
72 Hours	Primary School/ Restaurant & Café/ Small Departmental store (Not exceeding 2 Storey)	Site Plan, Plans with Furniture layout, Sections, Elevations, Perspective Drawing/s	120
6 Hours	Time Problem-Design of any of above facilities (Project brief provided)	Conceptual Drawings in Free Hand Sketches	60

Evaluation Schedule for each Exercise:

Week/Hrs	Stage	Marks
2/20Hrs	Literature & Case Studies	20
2/20 Hrs	Conceptual Design	40
3/32 Hrs	Final Design	60
Total		120

References:

1. Time Savers Standard- MC Graw Hill
2. Neufert Architectural Design Data

HISTORY OF ARCHITECTURE I

AR 502

Lecture : 4
 Tutorial : 0
 Practical : 0

Year : II
 Part : I

Course Objective:

From ancient time to the present, Architecture has been the major means of defining the human physical environment .The course briefly attempt to convey Architecture Knowledge as a contextual and constructive narration of western/ Eastern society up to French Revolution.

- To have Knowledge of the paradigmatic buildings in relation to the Artistic, Intellectual and Socio-Political originated and Aesthetic of the Historical Period and how difference in these conditions influenced the Architectural production
- To compare the different stage of development of Architecture and their influences as related to social, culture , religious, technological and climate of different periods
- To understand buildings as expression of formal or ideological opinions within their historical contest

Part A

1. Prehistoric period of Europe with emphasis on different types of structure built during Stone Age period (2 hours)
2. An overview of Egyptian or West Asiatic Architecture, their social, culture belief and reflection of their building/structure on built environment (8 hours)
3. Continuation of Building process from Minoan to Mycenaean and further to classical Greek Architecture on their social, cultural belief and reflection in their buildings as well as in urban development (8 hours)
4. Roman civilization and Architecture with methods of construction of Arches, vaults, dome in brick and concrete in these periods, their social and culture belief as reflection in their buildings and urban développement (8 hours)
5. Further development of Construction technology, space planning in Romanesque to Byzantine period (specific on Christian Church Architecture) (2 hours)

6. Evolution of Gothic Architecture and its influences later in development of modern Architecture (2 hours)
7. European Renaissance and revival of classicism in Architecture Baroque/Rococo and birth of Neo-Classical and Elective Architecture prior to Industrial Revolution (4 hours)

Part B

8. South Asian Eastern civilization –Mohenjo –Daro and Harappa Settlements in Indus valley and Vedic Period (2 hours)
9. Development of Architecture principle and materials used in Buddhist rock cut. (4 hours)
10. Gupta Architecture and development of Architecture (with Introductory of Dravidian Architecture) in context to the Religion Social, Culture, local Buildings materials and climatic condition and different types of decorative use during these period (8 hours)
11. Introduction to Vastu Shastra (2hours)
12. Chronology study of Muslim Architecture emphasis on Mogul period (6 hours)
13. An Introductory Study of Chinese, Japanese, Burmese & Indonesian Architecture (4 hours)

Internal Evaluation:

1. Students should prepare illustrated note books on at least three of the above topics with analytical notes.
2. Students should prepare a through analytical illustrated report on at least two structure of choice.

References:

1. Banister Fletcher "A history of Architecture"
2. Kostof Sriro "A History of Architecture: Settings and Rituals"
3. Michal Raebum " Architectural of Western World"
4. Jordan R. Fureaux "A Concise History of Western Architecture"
5. Sierlin Henri "Encyclopedia of World Architecture"
6. Crouch Dora "History of Architecture"

7. James Steven Curi "Oxford Dictionary of Architecture"
8. "The world Atlas of Architecture"
9. P Brown "Indian Architecture"
10. Prof. Suman Nandan Vaidya "Manual On History of Western Architecture"

BUILDING MATERIALS II

AR 503

Lecture : 3

Tutorial : 1

Practical : 0

Year : II

Part : I

Course Objective:

To provide knowledge of different building materials, develop understanding of properties, quality and uses of materials and their testing methods to determine their qualities.

1. Timber and Wood (9 hours)

- 1.1 Introduction
- 1.2 Classification of Timber Trees & types available in Nepal
- 1.3 Convection of Timber. Structure of exogenous tree (different components of tree)
- 1.4 Seasoning of Timber: Natural seasoning, Artificial seasoning
- 1.5 Decay and Preservation of Timber
 - 1.5.1 Object of Preservation
 - 1.5.2 Requirement of a good Preservative
 - 1.5.3 Different types of preservatives and their application
- 1.6 Defects in Timber
- 1.7 The use of Timber in Construction works
- 1.8 Timber and allied products (Sun mica, Formica)
- 1.9 Artificial wood & types

2. Metals (9 hours)

- 2.1 Ferrous Metals
 - 2.1.1 Ferrous Metals (Cast Iron, Wrought Iron, Mild Steel, Torsteel, TMT, Torkari)
 - 2.1.2 Standard section of M.S. used for construction purposes
 - 2.1.3 Rolled structural steel sections (Beam, Channel, T – Section, angle Sheet Section, Steel Flat Section, Steel and Strips, Steel Plates)
- 2.2 Non – Ferrous Metals (Aluminum, Copper, Zinc, Tin, Lead)
- 2.3 Alloys (Brass, Bronze, Steel Alloys-Stainless, Chromium & Nickel Steels)
- 2.4 Uses of Metals in Buildings. Study of use of material as structural or aesthetical purpose

3. Paints and Varnishes (9 hours)

- 3.1 Introduction and Need
 - 3.1.1 Characteristic of good paint and varnish
 - 3.1.2 Method of painting New and Old Wood and Metallic surfaces.

- 3.1.3 Different types of paints
 - 3.1.3.1 Cement Paint
 - 3.1.3.2 Distempers
 - 3.1.3.3 Emulsion
 - 3.1.3.4 Enamel Paint
 - 3.1.3.5 Damp – Proof Paint
 - 3.1.3.6 Water Proof Paint
 - 3.1.3.7 Weather Coat Paint
 - 3.1.3.8 Texture paint
 - 3.1.3.9 Creative Paint
 - 3.1.3.10 Fire proof paint

4. Insulators (3 hours)

- 4.1 Introduction and Types
 - 4.1.1 Thermo Insulator
 - 4.1.2 Sound Insulator

5. Miscellaneous Materials (3 hours)

- 5.1 Ferro Cement
- 5.2 Fire Protective Materials and Techniques
- 5.3 Asbestos Sheets Glass

6. Plasters (3 hours)

- 6.1 Cement Plaster
- 6.2 Lime Plaster
- 6.3 Mud Plaster

7. Wall & Floor Finishing (6 hours)

- 7.1 Plaster of Paris
- 7.2 Cement Putting
- 7.3 ACP
- 7.4 Different Types of Floor Finishing
 - 7.4.1 Cement type finish – Punning, Mosaic Finish.
 - 7.4.2 Material Finish – Tile, Marble, Wood, Brick, Stone etc.

8. Trend and Creativeness in Finishing Materials (3 hours)

Practical:

1. Market Survey of different types of natural and artificial wood
2. Market Survey of different types insulators and other newly produced building materials and report preparation and submission.

Internal Evaluation Scheme

- Survey Work (10)
- Assessment (10)

References:

1. Gurucharan Singh "Building Materials",
2. Sushil Kumar "Building Materials",

BUILDING CONSTRUCTION II

AR 504

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : II
 Part : I

Course Objective:

To provide knowledge to the students about temporary construction works, different components of buildings, R.C.C. constructions and retaining walls and basements with respect to damp proofing, doors and window types and details, timber stairs and roofs and their types and details.

1. **Temporary Works** (6 hours)
 - 1.1 Introduction to temporary construction works
 - 1.2 Shoring types need of shoring, underpinning
 - 1.3 Scaffolding, need of scaffolding, types of scaffolding,
 - 1.4 Formwork
 - 1.4.1 Characteristics and requirements of formwork,
 - 1.4.2 Material and sizes of formwork,
 - 1.4.3 Propping and removal of formwork.

2. **Simple Framed Buildings** (4 hours)
 - 2.1 Introduction to framed structure & parts of building
 - 2.2 R.C.C. components, columns, beam etc.

3. **Reinforced Concrete Structures** (4 hours)
 - 3.1 Introduction to R.C.C. structures
 - 3.2 Properties, advantages and failures in R.C.C. structures
 - 3.3 R.C.C. foundations, concrete frames, building frames, pre cast frames
 - 3.4 R.C.C. construction cast in situ

4. **Retaining Walls and Basement Construction** (4 hours)
 - 4.1 Retaining walls, dry stone walls, breast wall
 - 4.2 Conditions for stability of retaining walls
 - 4.3 R.C.C. retaining walls: cantilever type, counter fort type
 - 4.4 Construction of horizontal floors and vertical walls in basements
 - 4.5 Basic principles of water proofing of basements and piping through basements

5. **Doors and Windows** (4 hours)
 - 5.1 Types of timber doors and windows and ventilators
 - 5.2 Classification, materials used
 - 5.3 Metal doors & windows of steel/ aluminum
 - 5.4 Precautions in steel and aluminum

- 5.5 Comparison, advantages/ disadvantages of metal doors & windows
 5.6 Design details.

6. Timber Stairs (4 hours)

- 6.1 Introduction to stairs and terminologies
 6.2 Construction of stairs, design of steps as per requirements
 6.3 Dimensioning and fixing criteria
 6.4 Mathematical exercise in designing stairs especially dog-legged and open well types

7. Timber Roofs (4 hours)

- 7.1 Importance and contribution of timber in construction of buildings, timber constructions
 7.2 Single roof and its types, double roof, triple roof, various roof coverings viz. tiles
 7.3 Slates and metal sheets.

Practical Assignments:

Chapters	Hours	No. of Sheets	Marks
1	6	3	9
2,3	6	3	9
4	4	2	6
5	6	3	9
6	4	2	6
7	4	2	6
Total	30	15	45 + 5

References:

1. R. Barry, "The Construction of Buildings":, Volumes 1-5
2. R. Chudley, "Construction Technology", , Volumes 1-4
3. Chung, "Building Construction Illustrated",
4. Sushil Kumar, "Building Construction",
5. Rangawala, "Building Construction",
6. P.C. Varghese, "Building Construction",

DESIGN THEORY I

AR 505

Lecture : 3
 Tutorial : 1
 Practical : 0

Year : II
 Part : I

Course Objective:

- To establish a scope of theory of architecture including thematic/'positive' theories, 'normative' theories and procedural propositions in design thinking in building design.
- To introduce and develop basic understanding of thematic theories and **theories of synthesis in architecture**. To introduced and develop basic understanding of the theory of decisions.
- To enable students to study and analyze a design, design problem and process of design trough an application of associated positive, normative and procedural theories and to develop an ability of architectural criticism and opinion.

1. **Definition of Theory, Introduction to Theories of architecture – thematic, normative and procedural theories of design. Theory as post-design postulation after the masters. Ancient normative theories – Vastusastra (Mayamata) & Vitruvius on Architecture. Alberti and Palladio (Neo-classical renaissance) (7hours)**
2. **l'Art Nouveau (Viollet-le-Duc) and the language of form, Functionalism and Bauhaus. Structurist tradition, Systems building and Mies van der Rohe. Proportion and form-Le Corbusier's Modulor and five principles of new architecture. (8 hours)**
3. **Norberg-Schulz's Theory of architecture Structured around (14 hours)**
 - 3.1 Building tasks
 - 3.1.1 Physical requirements and control
 - 3.1.2 Functional frame
 - 3.1.3 Social milieu
 - 3.1.4 Cultural symbolism and psychological needs
 - 3.2 Form
 - 3.2.1 Definition
 - 3.2.2 Elements (Mass, space, surface)
 - 3.2.3 Relation (Topological, Geometrical, conventional)
 - 3.2.4 Formal Structure
 - 3.2.5 style
 - 3.3 Techniques
 - 3.3.1 Definition
 - 3.3.2 Material and methods of construction and structure, services,

environment and energy

- 3 Each technique to be detailed e.g. structure and material as Massive system or skeletal system, services e.g. sanitary, electrical or mechanical systems, light and air environment etc.

4. Design Thinking

(16 hours)

- 4.1 Procedures, rules and references observed in design thinking
- 4.2 Creative problem Solving – analysis of the design problem, synthesizing and organizing solutions, evaluating concepts, novelty and satisficing and stopping rules
- 4.3 Decision parameters
- 4.4 Heuristic reasoning and Design solutions
- 4.5 Christopher Alexander's pattern language

References:

1. Rowe, Peter: "Design Thinking"
2. Norberg-Chulz, Christain "Intensions In Architecture"
3. Norberg- Schulz, Christain " Genius Loci"
4. Rapoport, Amos, "House Form And Culture"
5. Alexader, Christopher, "A Pattern Language"
6. Johnson, Paul Alan, "Theory Of Architecture"
7. Broadbent, Geoffery, "Design Methods In Architecture"

BUILDING SCIENCE I

AR 506

Lecture : 3
 Tutorial : 1
 Practical : 0

Year : II
 Part : I

Course Objective:

- To introduce the concept of architectural Climatology and Thermal Aspects in relation to architectural design
- To deal with the use of Climatology and Thermal Aspects for comfort and security in building and built up environment

1. Climatology (16 hours)

1.1 Climatology

- 1.1.1 Introduction and Objectives of Climatology
- 1.1.2 Climate, Weather, Micro & Macro & Urban climate
- 1.1.3 Climatic factors – Solar radiation, wind, temperature, humidity, precipitation, sky condition & secondary factors
- 1.1.4 Climates of the world & Nepal

1.2 Solar Radiation

- 1.2.1 Type of Solar Radiation – Direct, Diffuse & Reflected
- 1.2.2 Solar Radiation – Absorption & Reflection on Earth
- 1.2.3 Geometry of Solar movement
- 1.2.4 Solar Chart & its uses

1.3 Solar Radiation & its control

- 1.3.1 Solar radiation control techniques – Orientation, vegetation, water body, color, texture
- 1.3.2 Shading devices – Internal & External
- 1.3.3 Shadow angles for shading devices
- 1.3.4 Design of external shading devices (Calculation)
- 1.3.5 Selective Transmittance

2. Thermal Aspects (14 hours)

2.1 Concept of Thermal Aspects

- 2.1.1 Heat transmission – Conduction, Convection & Radiation
- 2.1.2 Absorptivity & Reflectivity & Emissivity
- 2.1.3 Thermal Resistivity, Conductivity & Transmittance
- 2.1.4 Sol-air temperature, Solar gain factor,

2.2 Heat exchange in a building

- 2.2.1 Heat gain & loss in a building
- 2.2.2 Thermal balance in a room
- 2.2.3 Thermal Transmittance – wall, roof
- 2.2.4 Calculation of thermal transmittance of walls
- 2.2.5 Time lag & Decrement factor

- 2.3 Thermal Comfort and Thermal Control Techniques
 - 2.3.1 Thermal balance for human body
 - 2.3.2 Thermal comfort in a room
 - 2.3.3 Thermal Control Techniques in hot climate
 - 2.3.4 Thermal Control Techniques in cool climate
 - 2.3.5 Thermal Resistance & Insulation

3. Different Shelters For Different Climates (5 hours)

- 3.1 Different shelters in different climatic zones of Nepal
 - 3.1.1 Terai
 - 3.1.2 Hilly & Kathmandu Valley
 - 3.1.3 Mountain
- 3.2 Different shelters in different climatic zones of world
 - 3.2.1 Warm humid
 - 3.2.2 Hot arid
 - 3.2.3 Composite
 - 3.2.4 Cold

4. Shelters For Different Condition (10 hours)

- 4.1 Earthquake Resistant Building design
- 4.2 Buildings design with respect to wind movement
- 4.3 Building design in high and low humidity & Condensation
- 4.4 Building & Internal Comfort
- 4.5 Building design according to By-laws

Tutorial:

Observation and study of table with weather records of various places

1. Find out annual temperature graph & comfort range of different places
2. Calculation of Solar angles of different places from solar chart
3. Calculation of shadow angles for shading devices
4. Calculation of thermal transmittance of composite walls
5. Report of Climatology & Thermal Aspects (from above all)
6. Observation. Study and analysis of vernacular design and construction of shelters in different climatic zone of Nepal.
7. Unit Test

References:

1. Koenigsberger, Ingersoll, "Manual of Tropical Housing and Building", Orient Longman, Chennai, India,
2. S V Szokolay, A krishan, "Climate Responsive Architecture", Tata McGraw-Hill, New Delhi, India
3. Esmond Reid, "Understanding Building" -.
4. Er. B Pahari, "Passive Building-Concept & Design", KEC, Lalitpur, Nepal
5. F L Hong, "Architect's guide to climate design" - United Architects of the Philippines

6. "Climatological Records of Nepal" – Dept of Meteorology, GON,
7. S. Shresth, "Economic and Human Geography of Nepal"- Education Enterprises, Nepal
8. J M Boch-Isaacson, "Architecture & Construction Management in the Highland and Remote Areas of Nepal", Sahayogi Press, Nepal
9. G Toffin, "Man and His House in the Himalayas", Sterling Publishers, India
10. S. Nienhuys, "Insulation for Houses in high altitudes" Renewable Energy Documents-2003, SNV Nepal

STRUCTURE I

CE 507

Lecture : 3

Tutorial : 1

Practical : 0

Year : II

Part : I

Course Objective:

To understand the internal effects of loads and actions, simple stresses and strains.

1. **Introduction** (4 hours)
 - 1.1 Rigid bodies and deformable bodies
 - 1.2 Mechanics of materials - study of deformable bodies
 - 1.3 Basic definition of a structure
 - 1.4 Strength, stiffness and stability - fundamental characteristics
 - 1.5 Structural supports and support reactions
 - 1.6 Mechanical properties of materials
2. **Stress and Strain** (6 hours)
 - 2.1 Review of equilibrium and equations of equilibrium
 - 2.2 Method of section to analyse the internal effect of forces on a body
 - 2.3 Free body diagrams
 - 2.4 Notion of internal force and deformation
 - 2.5 Internal forces and deformations due to a general type of external load
 - 2.6 Notion of stress and strain
 - 2.7 4 cases of simple stresses and strains: Axial, Shear, Flexure and Torsion
 - 2.8 Force - Displacement relationship; Stress - Strain relationship
3. **Geometrical Properties of Section** (6 hours)
 - 3.1 Centroid of an area
 - 3.2 Moment of area
 - 3.3 Moment of inertia about perpendicular axes
 - 3.4 Polar moment of inertia
 - 3.5 Parallel axis theorem
 - 3.6 Section modulus
 - 3.7 Radii of gyration of sections about perpendicular axes
 - 3.8 Section Modulus
 - 3.9 Moment of inertia of compound sections
4. **Axial Stress and Strain** (6 hours)
 - 4.1 Simple case of axial forces and deformations (struts, bars, rods)
 - 4.2 Magnitude and direction of axial forces (Compressive and Tensile)
 - 4.3 Magnitude and direction of axial deformation (Shortening and Elongation)
 - 4.4 Axial stress and axial strain (Normal to plane)
 - 4.5 Hooke's law for simple axial stress and strain, Modulus of Elasticity

- 4.6 Stress - strain diagram
 - 4.7 Ultimate strength, factor of safety and working stress
 - 4.8 Lateral strain due to axial deformation, Poisson ratio
 - 4.9 Temperature stress and strain
 - 4.10 Hooke's law and elastic constants for cases other than simple axial case
 - 4.11 Review of relation between elastic constants
- 5. Shear (2 hours)**
- 5.1 Simple case of pure shear (riveted joint, bolted joint)
 - 5.2 Magnitude and direction of shear force (Tangential)
 - 5.3 Magnitude and direction of shear deformation (shear angle and linear)
 - 5.4 Shear stress and shear strain (Tangential to plane)
 - 5.5 Hooke's law for shear stress and strain, Modulus of Rigidity
- 6. Flexure (Pure Bending) (5 hours)**
- 6.1 Simple case of pure bending (beam without transverse shear force)
 - 6.2 Magnitude and direction of bending moment
 - 6.3 Magnitude and direction of flexural deformation (curvature and rotation)
 - 6.4 Elastic curve and neutral axis
 - 6.5 Bending stresses - theory of simple bending (Flexural formula)
 - 6.6 Design of homogeneous beam sections for flexure
- 7. Torsion (2 hours)**
- 7.1 Simple case of pure twisting of circular shaft
 - 7.2 Magnitude and direction of twisting moment
 - 7.3 Magnitude and direction of torsional deformation
 - 7.4 Shear stress due to twisting moment
- 8. Transverse Bending (8 hours)**
- 8.1 Pure, transverse, plane and oblique bending
 - 8.2 Review of beam reactions
 - 8.3 Magnitude and direction of Shear force and bending moment
 - 8.4 Sign convention of shear force and bending moment
 - 8.5 Relationship between rate of loading, shear force and bending moment
 - 8.6 Bending moment and shear force diagrams
 - 8.7 Deflection and angle of rotation
- 9. Columns and Struts (6 hours)**
- 9.1 Support conditions of columns and struts
 - 9.2 Equivalent length and slenderness ratio
 - 9.3 Buckling and buckling load
 - 9.4 Euler's formula for pin-ended columns
 - 9.5 Euler's formula for columns with other end conditions

References:

1. Beer & Johnston, "Mechanics of Materials", McGraw-Hill Co
2. Hibbler, "Mechanics of Materials",
3. Timoshenko & Gere, "Strength of Materials",

DESIGN STUDIO IV

AR 551

Lecture : 0
 Tutorial : 0
 Practical : 10

Year : II
 Part : II

Course Objective:

- To understand steps in design methodology through studio problems.
- To programme and formulation of concept in architectural studio assignments.
- To generate of Bubble Diagram to establish a functional relationship among various spaces.
- To apply of climatic data, basic structural and social consideration in architectural design.
- To apply method of construction, & materials,

Exercise No./Hours	Suggested Project	Content of submission	Marks Distribution
72 Hours	High School / College/ Community Library/ Club (not exceeding 3 storey)	Master Plan, Plans, Sections, Elevations, Perspective Drawing/s Model	120
72 Hours	College/University facility- as Gymnasium/ Hostel/ Club/ Multi purpose Hall/ Auditorium. (not exceeding 3 storey)	Master Plan, Plans, Sections, Elevations, Construction details, Perspective Drawings, Model	120
6 Hours	Time Problem-Design of any of above facilities (Project brief provided)	Conceptual Drawings in Free Hand Sketches	60

Evaluation Schedule for each Exercise:

Week/Hrs	Stage	Marks
2/20Hrs	Literature & Case Studies	20
2/20 Hrs	Conceptual Design	40
3/32 Hrs	Final Design	60
Total		120

References:

1. "Time Savers Standard" Mc Graw Hill
2. "Neufert Architectural Design Data"

HISTORY OF ARCHITECTURE II (NEPALESE ARCHITECTURE)

AR 552

Lecture : 4
Tutorial : 0
Practical : 0

Year : II
Part : II

Course Objective:

This Course briefly surveys the Architecture Knowledge as a contextual and constructed narration on Nepalese Architecture

- To have Knowledge of the paradigmatic Buildings in relation to the Artistic, Intellectual and Socio – Political originated on Aesthetic condition of historical period and how differences in this condition influenced the Architectural production
- To Compare the different stage of development of Architectural on related Planning and their influences as related to social, cultural, religion, technological of climate different periods
- To understand Buildings/structures as expression of formal ideological opinions with their historical context
- To understand the relationship between the old and new building, between building and environment and also to develop ability for conservation, adaptation and transformation.

1. Chronology study of different stages of development of Nepalese Architecture and their influencing factors: Social, Cultural, Religious, Technology, Climate, Material and Economy, study form, function and symbolism

- | | |
|---|------------|
| 1.1 Early Civilization Kirat and Lichhavi | (10 hours) |
| 1.2 Malla Period (12-18th Century) | (20 hours) |
| 1.3 Early Shah Period (18-19Century) | (10 hours) |
| 1.4 Rana Period (1846-1950) | (10 hours) |

(Coverage should include both secular and religious buildings. Religious building of both the Hindu and Buddhists should be treated separately. Specific examples for Study- a. Palace Architecture, b. Temple & Stupa, c. Priest House d. Bahals and Bahils. Development of House Form and comparison of Buddhist and Hindu Architecture of the Kathmandu Valley)

- | | |
|--|-----------|
| 2. Development of Brick and Brick work | (1 hour) |
| 3. Development of Wood work and Carving | (1 hour) |
| 4. A brief introduction of Historical and Vernacular Architecture of Terai, Hill and Mountain Regions of Nepal | (8 hours) |

Internal Evaluation:

1. Students should prepare illustrated note books on at least three of the above topics with analytical notes.
2. Students should prepare a through analytical illustrated report on at least two structure of choice.

References:

1. Sudarshan R. Tiwari, "Tiered Temples of Nepal"
2. Wolfgang Korn, "The Traditional Architectural of the Kathmandu Valley"
3. "The Physical Development Plan for the Kathmandu Valley" Government of Nepal
4. R.M. Bemier, "Temples of Nepal"
5. F. Hoskan, "The Kathmandu Valley Towns"
6. J. Sanday, "Monuments of Kathmandu Valley"
7. M.S. Slusser, "Nepal Mandala"

BUILDING CONSTRUCTION III

AR 554

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : II
 Part : II

Course Objective:

Impart knowledge to the students about steel in structural works, roof trusses, concrete floors and pavements, cast in situ and precast concrete stair types, framed buildings and foundations, joints in concrete, internal and external claddings, false ceilings and on cavity walls, curtain walls and light weight partitions etc.

1. **Steel Structures** (2 hours)
 - 1.1 Shapes of structural steel, uses of rivet in steel works and welding methods
 - 1.2 Types of steel structural members, beams, columns and girders.
2. **Roof Trusses** (4 hours)
 - 2.1 Types of timber and steel trusses
 - 2.2 Flat and pitched trusses out of timber and steel, comparison and uses
3. **Concrete Floors** (4 hours)
 - 3.1 Introduction to floors,
 - 3.2 Types of R.C.C. floor, upper floor/ framed and self-centering floors
 - 3.3 Construction in grade and pavements.
4. **Concrete Stairs** (4 hours)
 - 4.1 Precast and cast in situ concrete stairs
 - 4.2 Types and constructions
5. **Framed Building & Foundations for Buildings** (2 hours)
 - 5.1 Types and shapes of columns, their usage, role of binders
 - 5.2 Types of beams
 - 5.3 R.C.C. foundation, Foundation shape and reinforcements
6. **Joints in Concrete** (4 hours)
 - 6.1 Different construction joints in concrete
 - 6.1.1 Construction joint,
 - 6.1.2 Expansion joint,
 - 6.1.3 Contraction joint,
 - 6.1.4 Isolation and sliding joint,
 - 6.1.5 Joints between precast concrete cladding panels
 - 6.2 Location of joints for different elements; slabs, beams, columns, walls
 - 6.3 Bonding of new concrete to old

- 6.4 Materials used in expansion joints
 - 6.4.1 Joints in walls,
 - 6.4.2 Joints in frame walls,
 - 6.4.3 Joints in floors,
 - 6.4.4 Joints in roofing
- 6.5 Spacing of expansion joints
- 7. Claddings (4 hours)**
 - 7.1 Cladding for external and internal finishes, necessities and usage
 - 7.2 Plasterwork paints, dry lining, tiles, quarry tiles and internal fixings.
- 8. False Ceiling (2 hours)**
 - 8.1 Usage of false ceiling, materials and construction technology.
- 9. Walls and Partitions (4 hours)**
 - 9.1 Introduction to cavity walls, purpose, stability
 - 9.2 Building regulations for cavity walls with reference to materials and constructions
 - 9.3 Comparison of pros/cons of cavity walls
 - 9.4 Curtain walls, materials used and concept of load transference
 - 9.5 Windows walls, illumination visual effect, daylight, heating
 - 9.6 Lightweight partitions, advantages, materials used, requirements, timber partitions, lining materials
 - 9.7 Steel framed partitions

Practical Assignments:

Units	Hours	No. of Sheets	Marks
1	4	2	6
2	2	1	3
3	4	2	6
4	4	2	6
5	4	2	6
6	2	1	3
7	4	2	6
8	2	1	3
9	4	2	6
	30	15	45 + 5

References:

1. R. Barry, "The construction of buildings", Volumes 1-5
2. R. Chudley, "Construction Technology", Volumes 1-4
3. Hans Banz, "Building Construction Details"(Practical Drawings)
4. Sushil Kumar, "Building Construction"
5. Gurcharan Singh, "Building Construction and Materials"
6. Rangawala, "Building Construction"
7. P.C. Varghese, "Building Construction"

DESIGN THEORY II

AR 555

Lecture : 3
 Tutorial : 1
 Practical : 0

Year : II
 Part : II

Course Objective:

- To develop an understanding of theory of architecture including thematic/'positive' theories, 'normative' theories and procedural propositions in design thinking in environmental aspects of building design and site planning. To develop an understanding of the theory of decisions.
 - To enable students to study and analyze a design, design problem and process of design through an application of associated positive, normative and procedural theories regarding building and site environment and to develop an ability of criticism and opinion.
1. **Doctrinal theories of architecture and design thinking with reference to works of the masters- Frank L Wright, Mies Van der Rohe, Le Corbusier, Louis I Kahn. C** (5 hours)
 2. **Orientation and Memory, Enclosure, Territory, Defensible spaces and private/public space. Concept of territory inherent in a build environment system, Territorial concepts in exploring design possibilities for architectural programs, Hierarchy of spaces. Social factors affecting behavior in the built environment.** (5 hours)
 3. **Space and Place: visual and spatial structure for a range of scales. Theories of Figure/Ground. Linkage and place.** (5 hours)
 4. **Legal rights of space, Ownership and Tenure, Concepts in building types: Public Housing, Apartments, Squatter settlements, Leased space and Property.** (4 hours)
 5. **Zoning ordinances and building regulations. Urban utilities and site services. Public Good, Public Interest and Interest of Community in urban context. Physical, Socio-cultural and historical environment and concerns.** (4 hours)
 6. **The Design process** (10 hours)
 - 6.1 Measurable aspects of design e.g. physical environment in design – spatial/physical requirements, dimensions of space and architectural elements established by proportion of the human body, structural possibilities of available materials and technology.

- 6.2 Non-measurable aspects: aspects of the design process to do with emotional. Social, cultural, sentimental, psychological. Architectural symbolism, message and meaning in architecture – sensual identity/dimensions of architectural space and form. Architecture and decoration.
- 6.3 Evaluation of alternatives and selection of solution.

7. Site analysis and the relationship of natural systems components: micro and macro climate, ecology, soils and subsurface conditions, physiographic, visual character and land use.

Physical, social and cultural context and linkages with the outside, neighborhood and town. User and Interest groups, Community, barrier and encouragement: Urban landscape – complexity and heterogeneity in urban sites, Multiple layer of cultural meaning and activities.

Synthesis and Interpretation of site data, Design response, Determination of program/site 'fit'. Master planning, Site planning. (12 hours)

References:

1. Banham, R, "Age of the Masters"
2. Rowe, Peter, "Design Thinking"
3. Norberg-Chulz, Christain, "Intensions In Architecture"
4. Norberg- Schulz, Christain, "Genius Loci"
5. Rapoport, Amos, "House From And Culture"
6. Alexader, Christopher, "A Pattern Language"
7. Johnson, Paul Alan, "Theory of Architecture"
8. Broadbent, Geoffrey, "Design Methods In Architecture"
9. Lynch, Kevin, "A Theory of Good City Form"
10. Lynch, Kevin, "The Image of the City"
11. Hall, Edwards, "The Hidden Dimension"
12. Altman I, "The Environment and Social Behavior"
13. Habrakan, John, "Transformation of a Site"

STRUCTURE II

CE 557

Lecture : 3
 Tutorial : 1
 Practical : 0

Year : II
 Part : II

Course Objective:

To understand the behavior of various structures under loading, and methods to analyze structural components

1. **Introduction** (6 hours)
 - 1.1 Structural elements - bar, plate, block and their characteristics
 - 1.2 Geometrical stability of framed structures
 - 1.3 Basic definition of a structure
 - 1.4 Stability, statically determinate and indeterminate structures
 - 1.5 Statically determinate plane trusses
 - 1.6 Joint method to determine member forces of a plane truss
 - 1.7 Section method to determine member forces of a plane truss
 - 1.8 Introduction to space trusses

2. **Energy Principles** (12 hours)
 - 2.1 Linearly elastic structures
 - 2.2 Principle of superposition
 - 2.3 Maxwell reciprocal theorem
 - 2.4 Betti's law
 - 2.5 Real work and virtual work
 - 2.6 Strain energy
 - 2.7 Strain energy due to axial force, shear force, bending moment and torsion
 - 2.8 Real work method to determine displacements, and its limitations
 - 2.9 Virtual work method to determine displacements
 - 2.10 Unit load method to determine deflection of beams and frames
 - 2.11 Moment area theorems I and II
 - 2.12 Moment area method to determine the deflection of beams and frames

3. **Introduction to Influence Line Diagrams** (6 hours)
 - 3.1 Moving loads
 - 3.2 Concept of Influence Line Diagrams
 - 3.3 Significance of Influence Line Diagrams
 - 3.4 Influence Line Diagrams for Reactions, Shear Force and Bending Moment
 - 3.5 Determination of stresses from Influence Line Diagrams

- 4. Three Hinged Systems (6 hours)**
- 4.1 Statically determinate arches and frames
 - 4.2 Parabolic and circular three hinged arches
 - 4.3 Support reactions, shear, thrust and bending moment in a three hinged arch
 - 4.4 Three hinged arches with supports at different levels
- 5. Introduction to Analysis of Indeterminate Structures (15 hours)**
- 5.1 Statically indeterminate structures
 - 5.2 Introduction to slope deflection method
 - 5.3 Fixed end moments due to transverse loads
 - 5.4 Fixed end moments due to support rotations and support settlements
 - 5.5 Basic slope deflection equations
 - 5.6 Analysis of indeterminate beams and frames by slope deflection method
 - 5.7 Introduction to moment distribution method
 - 5.8 Stiffness, distribution factor and carry over factor
 - 5.9 Modified stiffness
 - 5.10 Analysis of indeterminate beams and frames by moment distribution method

References:

- 1. S Negi & R S Jangid, "Structural Analysis", Tata McGraw Hill
- 2. C S Reddy, "Basic Structural Analysis", Tata McGraw Hill
- 3. Pundit & Gupta, "Structural Analysis", Tata McGraw-Hill
- 4. Hibbler, "Structural Analysis", Prentice Hall
- 5. E P Popov, "Mechanics of Solids", Prentice Hall of India

SURVEYING

CE 558

Lecture : 4
 Tutorial : 0
 Practical : 4

Year : II
 Part : II

Course Objective:

To provide fundamental knowledge of land measurement and surveying techniques to the architectural engineering students so that they will be able to learn and apply the suitable survey procedure and equipment for producing map.

1. **Introduction** (3 hours)
 - 1.1 Definition and historical background of surveying
 - 1.2 Principle of surveying
 - 1.3 Discipline of surveying and their significance
 - 1.4 Scales, conventional surveying

2. **Linear Measurements** (7 hours)
 - 2.1 Units for distance and area measurements
 - 2.2 Distance measurements technique and equipment
 - 2.3 Accuracy, precision, error, sources of error, types of error
 - 2.4 Use of abney level and clinometers for distance measurements
 - 2.5 Principle of EDM and its application in distance measurements
 - 2.6 Various corrections for linear distance measurements

3. **Chain and Offset Survey** (3 hours)
 - 3.1 Introduction
 - 3.2 Methods and principle of chain survey
 - 3.3 Obstacles in chaining/ranging
 - 3.4 Field instruction of chain survey

4. **Compass Traversing and Traverse Computation** (7 hours)
 - 4.1 Introduction, definition of meridian, bearing and azimuth
 - 4.2 Compass types, system of bearing, conversion from one system to another
 - 4.3 Calculation of angles from bearings and vice versa
 - 4.4 Magnetic declination and dip, variation in magnetic declination, relation between true bearing, magnetic bearing and declination
 - 4.5 Errors in compass survey (local attraction and observational error)
 - 4.6 Field work and field book maintaining
 - 4.7 Computation and plotting a traverse
 - 4.8 Graphical method of distribution of error and permissible precision.

5. **Leveling** (8 hours)
 - 5.1 Basic definition and importance of leveling
 - 5.2 Methods of leveling according to principles used

- 5.3 Levels and level rods, foot plates, rod bubbles
- 5.4 Temporary and permanent adjustment of level, two peg test
- 5.5 Booking and calculation of reduced level
- 5.6 Classification of leveling, Δy leveling, profile leveling, cross sectioning, reciprocal leveling, precise leveling
- 5.7 Adjustment of level circuits
- 5.8 Sources of errors in leveling

6. Contouring (4 hours)

- 6.1 Introduction, definition of contour interval, horizontal equivalent,
- 6.2 Factor affecting contour interval, characteristics of contour interval
- 6.3 Methods of locating contours
- 6.4 Methods for interpolation of contours
- 6.5 Uses of contour maps

7. Area and Volume (6 hours)

- 7.1 Area computed by subdividing the triangles
- 7.2 Area by coordinates method
- 7.3 Area within irregular boundaries, trapezoidal rules, Simpson's 1/3 rules
- 7.4 Area by mechanical method (planimeter-digital and analogue)
- 7.5 Measurement of volume using prismoidal and trapezoidal formula

8. Plane Table Survey (4 hours)

- 8.1 Introduction and definition
- 8.2 Principles and methods of plane tabling
- 8.3 Accessories used in plane tabling
- 8.4 contour map using plane table and label instrument (direct method of contouring)
- 8.5 Advantages and disadvantages of plane tabling

9. Theodolite and traversing (6 hours)

- 9.1 Basic definition
- 9.2 Construction principle and parts of transit and theodolite
- 9.3 Temporary adjustment of transit and theodolite
- 9.4 Measurements of horizontal angle and vertical angles
- 9.5 Needs and significance of traversing
- 9.6 Field words for traversing, traverse field notes
- 9.7 Traverse computation for closed and link traverse, reduction of reading to angles, balancing of angles, computation of bearings and adjustment of bearings, computation of latitudes and departures, balancing of consecutive coordinates, computation of independent coordinates and plotting of traverse
- 9.8 Field problems and instructions

10. Tacheometry (5 hours)

- 10.1 Principle of optical distance measurements

- 10.2 Stadia method, Tangential method using staff vertical and horizontal distance using sub tense bar
- 10.3 Booking and plotting of details
- 10.4 Field problems and instruction

11. Total Station (3 hours)

- 11.1 Introduction
- 11.2 Features of Total Station
- 11.3 Field procedures for Total Station in Topographical Surveying

12. Layout of Building with Different Methods (4 hours)

- 12.1 Introduction
- 12.2 Setting out by using chain and tape only for small building
- 12.3 Setting out by using theodolite and tape for large building
- 12.4 Setting out vertical control-setting out level and large building sites from foundation to floor level. Use of leveling for instrument for fixing.

Field Works and Practical:

	Hours
1. Linear measurement techniques in plane and sloping ground	4
2. Field survey using chain, tape and compass	8
3. Two peg test and fly leveling	8
4. Leveling field survey to determine profile and cross section	8
5. Plane table survey and preparation of topo map using level	8
6. Traverse angle distance measurement using theodolite and total station	8
7. Computation and plotting of theodolite traverse including details	12
8. Setting out practice for building	4

Internal Evaluation

50 marks: from field performance, viva, instrumentation and report

References:

- 9. R Banister and S Raymond, "Surveying- ELBS"
- 10. BC Punima, "Surveying" Laxmi Publishers New Delhi
- 11. R. Agor, "Surveying and Leveling" Khanna Publishers, Delhi
- 12. N NBasak, "Surveying" Tata McGraw Hill Education Private Limited New Delhi

DESIGN STUDIO V

AR 601

Lecture : 0
 Tutorial : 0
 Practical : 12

Year : III
 Part : I

Course Objective:

- To derive an architectural program for the project through case studies and literature references.
- To establish a relation between functional requirements with the form, function & structural requirements of a building.
- Understand the influence of site, climate and technology on building design.

Exercise No. /Hours	Suggested Project	Content	Marks Distribution
174 Hours	Multi utility facilities for masses-Museum, Art gallery, Commercial complex / Office Building/ Housing for multi families-Apartments	Master Plan, Plans, Sections, Elevations, Construction Details. Perspective Drawing Model	240
6 Hours	Time Problem – Design of any of above facilities (Project brief provided)	Conceptual Drawings in Free Hand Sketches	60

Evaluation Schedule for Project work:

Week/Hrs	Stage	Marks	Remarks
4 48 Hrs	Literature & Case Studies	40	
4 48 Hrs	Conceptual Design	80	
6.5 78 Hrs	Final Design	120	
Total		240	

References:

1. Time Savers Standard
2. Neufert Architectural Design Data

CONTEMPORARY ARCHITECTURE

AR 602

Lecture : 4

Tutorial : 0

Practical : 0

Year : III

Part : I

Course Objective:

An introductory survey of the history of Architecture and Urbanism in the context of rapidly changing Technologies and Social circumstances of the last 120 years.

- To have a Knowledge of the History of Modern Architecture and understanding the formal, philosophical, Social, technical and economic background of the important Architectural direction in global context.
- To compare the different stage of Development of Architecture on Related planning by Individual Architects of 19th to 20th Century.
- To understand Buildings /Structure as expression of formal ideological in terms of new materials and technology
- To show the interest in the Culture and ideological meaning of Buildings/ Structures

1. **Introductory Looking of contemporary Architecture after the Industrial Revolution with respect to new Building methods& technologic of construction and its influences prevailing Architectural style of the world** (2 hours)
2. **Romanticism in Architecture and Expressionism in Architecture** (4 hours)
3. **Expression of Architects of BAUHAUS Movement and International Style - Walter Groupies, Mies Van de Rohe and Hanees Meyer** (6 hours)
4. **Development American Architecture CHICAGO of Architecture** (4 hours)
5. **Classical Rationalism in France –ART-NOVEAU and Development of Art & Craft Movement in England** (4 hours)
6. **Futurism of Germany/ Italy and DE STIJL and Amsterdam SCHOOL** (4 hours)
7. **Russian Constructivism** (2 hours)
8. **Modern/post Modern Architecture** (4 hours)
9. **Architecture in the electronic media, emerging concept-Futuristic Architecture** (6 hours)
 - High-tech Architecture (2hr)
 - Sustainable Architecture
 - Dynamic Architecture

As a futurist vision, concluding part of the course gives as idea about present revolution in science & technology, emerging concept of human habitat if possible change and future possibility in architecture.

10. Ideas, theories of Architecture and the Critical Appraisal of Concept and Practices of great Architects of modern period and their works (16 hours)

Walter Gropius	Frank Lloyd Wright	Mies Van der Rohe
Le – Corbusier	Philip Johnson	Louis Khan
Alvar Aalto	KenzoTange	Tadao Ando
Charles Correa	Robert Ventury	James Sterling
Michael Graves	B P Doshi	ZahaHadid
Norman Foster	Richard Rogers	Renzo Piano

11. Critical Appraisal of Concepts and practices of Contemporary Architects of Nepal and their works (8 hours)

Recommended Methods for Internal Evaluation:

1. Students should prepare illustrated note books on at least three of the above topics with analytical notes.
2. Students should prepare a through analytical illustrated report on at least two structure of choice.

References:

1. Banister Fletcher, "A history of Architecture",
2. KostofSriro, "A History of Architecture: Settings and Rituals"
3. Sierlin Henri, "Encyclopedia of World Architecture"
4. Crouch Dora, "History of Architecture"
5. James Steven Curi, "Oxford Dictionary of Architecture"
6. The World Atlas of Architecture
7. Konemann Verlagsgesellschaft, Cologne, "The History of Architecture of the 20th Century", Germany
8. Internet Study

COMPUTER-AIDED DESIGN & DRAFTING**AR 603****Lecture : 0****Year : III****Tutorial : 0****Part : I****Practical : 4****Course Objective:**

To understand the fundamental concept of Computer-Aided Design/Drafting. To enable to prepare Two-Dimensional and Three-Dimensional architectural drawing and modeling them through Computer-Aided Design/Drafting.

1. Introduction to CADD (2hours)

Overview, Required equipment, Optional equipment, The AutoCAD drawing, Creating the drawing points and coordinate system, WCS, UCS, Coordinate System Icon, drawing units and scaling, drawing limits and setups.

2. Utility Commands and Services (2hours)

Help, Qsave, Save as, Save, Savetime, Status, Menus

3. Entity Draw Commands and Drawing Aids (4 hours)

- 3.1 Drawing simple and Continuous lines Line, Polylines, Rectangle, Polygons, construction Lines, Rays
- 3.2 Curves and point Object Circles, Arcs, Ellipse and elliptical arcs, Donuts, Points
- 3.3 Drawing Aids Isometric, Snap, Grid, Ortho, Object Snap, Polar Tracking, Object Snap Tracking, Dynamic Input, Isoplane, UCS
- 3.4. Function Keys

4. Edit and Inquiry Commands (4hours)

- 4.1 Coping and Moving Move, Copy, Rotate, Scale, Mirror, Stretch, Array
- 4.2 Changes, Cuts and Constructions Chprop, Break, Trim, Extend, Fillet, Chamfer, Offset, Lengthen, Stretch, Scale, Lengthen
- 4.3 Polylines editing Pedit, Explode
- 4.4 Undoing Redo, Undo, Oops
- 4.5 Inquiry commands List, Dblist, ID, Dist, Area

5. Working with Text (2 hours)

Creating simple Text, Setting Text Properties, Creating Multiline Texts, Editing Texts, Special Text Properties-MIRRTTEXT, QTEXT, DTEXT.

6. Display Controls (2hours)

Zoom, Pan, Managing multiple viewports, Redraw, Regen, Regenall

- 7. Entity Properties (4hours)**
Layers, Colors, Linetype, Lineweight, Ltscale
- 8. Blocks, Attributes and External References (4hours)**
Creating and inserting a Block
Block and Xref editing
- 9. Dimensioning and Hatching (8hours)**
9.1 Associative dimensioning Dimension types and their components, Setting up dimension style
9.2 Hatching and pattern filling Hatch patterns, Defining the Boundary, Hatching style, Hatch pattern alignment
- 10. Working in Model space and Paper Space (4hours)**
- 11. Plotting / Printing (4hours)**
Changing Pen and Linetype parameters, Changing basic plot specifications, Saving Plot specifications, Readyng the plotter, Efficient Printer Plotting
- 12. Types of 3D Models and Three-Dimensional Coordinate System (4hours)**
12.1 Three-Dimensional models Wireframe Model, Surface Model, and Solid Model
12.2 Using Right Hand Rule
12.3 Three-Dimensional Coordinate System Rectangular, Cylindrical, Spherical
12.4 Working with Users Coordinate systems
12.5 Working with Viewports
- 13. Three-dimensional Solids (4hours)**
13.1 Three-Dimensional Solid Modeling Box, Cone, Cylinder, Sphere, wedge
13.2 Creating Derived Three-Dimensional solids Creating Extruded Solids, Creating revolved solids
13.3 Boolean operations in solids Creating a composite solid-Union, Subtract, Intersect
- 14. Editing and Modifying Three-dimensional Solids (4hours)**
14.1 Editing Three-Dimensional Solids Rotate3d, Mirror3d, 3darray, Align
14.2 Advanced Modifying Tools in Solids Fillet, Chamfer, Slice, Section
- 15. Three-dimensional Surfaces (4hours)**
15.1 Three-Dimensional Surface Modeling 3dface, pface
15.2 Creating derived Three-Dimensional surfaces Ruled surface, tabulated surface, 3d polygon mesh, revolved surface
15.3 Drawing Three-Dimensional surface primitives -Creating redefined 3D surface meshes

16. Working with Advanced Three-Dimensional Viewing (4hours)

3D Orbit, Using projection option in 3D orbit, Shading in 3d orbit, Adding visual aids in 3D orbit, Resetting and presetting in 3D orbit, Using Dynamic viewing

References:

1. George Omura, "AutoCAD 2000", BPB Publications B-14, COUNNAUGHT PALACE, New Delhi-11001
2. Sham Tickoo, "AutoCAD 2005 for Engineers & Designers", Dreamtech Press.
3. Software manuals are to be announced depending on Instructors.

Evaluation Scheme for each stage:

The following evaluation scheme shall be followed for continuous assessment.

Stages	Hours	Marks
Two-dimensional drawing	36	60
Three dimensional drawing and rendering	20	30
Plotting / printing	4	10

BUILDING CONSTRUCTION IV

AR 604

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : III
 Part : I

Course Objective:

To provide knowledge to the students about portal frames, shell roofs and domes; fireplaces and chimneys; traditional timber construction; sound and thermal insulation; prevention of fire effects in buildings; measures to protect building components and finishes; various building service elements and about techniques for sustainable construction in buildings.

Course Details:

1. **Portal Frames, Shell Roofs and Domes** (4 hours)
 Introduction to portal frames and their advantages, types of portal frames. Introduction to shell and vault roofing systems, their construction and uses. Introduction to domes and construction.
2. **Fireplaces and Chimneys** (2 hours)
 Introduction to fireplaces and chimneys, terminologies, their design parameters, construction details and performances
3. **Traditional Timber Construction** (4 hours)
 Introduction to the traditional timber construction of Nepal, explaining various elements such as posts, doors, windows and roofs, and their types. Prevention and protection from decay.
4. **Insulation: Sound and Thermal** (4 hours)
 Sound and Thermal insulation requirements and techniques to address the same with various construction methods and material availability.
5. **Fire Prevention in Construction** (4 hours)
 Introduction to fire prevention and protection techniques with respect to materials, design and construction. Fire load, fire escape and evacuation requirements.
6. **Preventive and Remedy Measures in Buildings** (2 hours)
 Prevention measures and remedy of building elements and applications from rotting, corrosion, efflorescence, and rusting. Surface finishing preventing deterioration due to formation of efflorescence, leaching and staining.

7. Building Service Elements (6 hours)

Introduction to various service elements in buildings and their technical parameters. The uses and functions of elements viz. lifts and elevators etc.; water supply and drainage; electrical supply and distribution; heating, ventilation and air-conditioning.

8. Sustainable Construction Techniques (4 hours)

Introduction to sustainable construction and planning techniques through greenhouse concepts, cost effective construction, eco friendly concepts and self-sustaining concepts: bio gas, solar and rain water harvesting.

Practical Assignments:

S. No	Units	Hours	No. of Sheets	Marks
1	1	6	3	9
2	2	4	2	6
3	3	6	3	9
4	4	4	2	6
5	5, 6 & 7	8	4	12
6	8	2	1	3
Total		30	15	45 + 5

References:

1. R. Barry, "The construction of buildings", Volumes 1-5
2. R. Chudley, "Construction Technology", Volumes 1-4
3. Hans Banz, "Building Construction Details"(Practical Drawings)
4. Sushil Kumar, "Building Construction"
5. Gurcharan Singh, "Building Construction and Materials"
6. Rangawala, "Building Construction"
7. P.C. Varghese, "Building Construction"

WORKING DRAWING

AR 605

Lecture : 0

Tutorial : 0

Practical : 4

Year : III

Part : I

Course Objective:

Expected Learning objectives by students after completion of this course are as follows:

- After the completion of this course the students will be able to make complete set of working drawings.
- The students will make one complete set of manual working drawings of a 3 storey residential building of approx. 1000Sq.Ft.plinth area of their own design completed in previous design Studio classes.

The drawing, in A2 size, to be prepared is as follows:

S.No.	Topics	Sheets	Hrs	Marks
A	ARCHITECTURAL DRAWINGS PLANS(Scale 1:200 or 1:100)			
A.1	Location map/ site plan with setting out of building and infrastructure services lines	4	8	16
A.2	Floor Plans (Scale 1:50)			
A2.1	Basement or cellar/ Ground /First/ Second floor plans.			
A2.2	Roof/ Terrace plan with staircase block cover			
B	ELEVATIONS & SECTIONS (Scale 1:50,1:20,1:10)			
B.1	Front/ Back/ side Elevations (N/S/E/W or Orientation wise)			
B.2	Longitudinal & Cross Section thru staircase	2	4	8
B.3	Blow up detail of external/ internal wall section from foundation footing to coping/ ridge showing all necessary elements.			
C	TRENCH /FOUNDATION PLAN & SECTION(Scale 1:50, 1:20, 1:10)			
C.1	Trench plan / Setting out			
C.2	Foundation footing Plan	2	8	8
C3	Trench Section showing timbering of trenches (external/ internal wall)			
C4	Foundation Footing Section			
C5	Blowup details as necessary			
D	STAIRCASE (Scale 1:20 , 1:10& 1:5)			
D.1	Plan			
D.2	Sectional Elevation with elements as handrail, balusters, steps & finishes etc.	2	4	8
D.3	Other miscellaneous items such as ladder, spiral stair, ramp etc. if any.			

E	OPENINGS (Scale 1:50, 1:20 & 1:10)			
E.1	External Gate - Elevation, 2 sections (Horizontal & Vertical) and blowup details			
E.2	Main Door - Elevation, sections, and blowup details.			
E.3	Internal Door - Elevation, sections and blowup details..	4	8	16
E.4	Window & Ventilator (Scale 1:20, 1:10 & 1:5)			
E.5	Elevation, Sections, and blowup details Showing sill, lintel, chajja & shading devices etc.			
E6	Arch and skylight details.			
	Preparation of Doors/windows schedule			
F	CEILING/TERRACE/ROOF (Scale 1:50, 1:20 & 1:10)			
F.1	Bonded Ceiling & False Ceiling. Plan & Sections and fixing details			
F.2	Roof (Pitch/ Flat/ Shell or Dome) Plan and sections.	1	4	4
F.3	Ridges, Eaves, valley, Hips, coping, flashing, skating with D.P.C. etc. details including sound and thermal isolative materials.			
G	WALL/MASONRIES & COLUMNS			
G1	Elevations & sections showing bonds.			
G2	Miscellaneous details-buttrresses, threshold, plinth, window sill, jambs, corbels, copings, ornamental brick/stone/concrete work etc.	1	4	4
H	BATHROOM & KITCHEN			
H.1	Lay-out Plan.			
H.2	Elevations & Sections	2	4	8
H.3	Details as necessary.			
I	STRUCTURAL DRAWINGS			
I.1	Foundation (scale 1:20 & 1:10)			
I.2	Footing Detail -Plan and Sections.			
I.3	Plinth Band, Tie Beams Bar bending schedule.			
J	Column, Beam & Slab (scale 1:50, 1:20, 1:10)	2	4	8
J1	Typical Column sections			
J2	Typical Beam sections			
J3	Typical Slab Sections			
J4	Miscellaneous details as staircase, ramp, chajja, lintel, arch, duct & pergolas etc.			
	Time Problem 1 (A,B,C,D&F)	1	6	10
	Time Problem 2 (E,F,G&H)	1	6	10

Reference

1. Wakitalinda, "The Professional Practice of Architectural Working (part A and B)"
2. M.G. Shah, C M Kale & S. Ypatki, "Building Drawing with an Intergraded Approach to Build Environment"
3. R. Chudley, "Construction Technology Vol 1, 2, 3 & 4"
4. J.T. Grundy, "Construction Technology Vol I & II"
5. Ernst Neufert, "Architect's Data"

BUILDING SERVICES I

CE 607

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : III
 Part : I

Course Objective:

To provide fundamental knowledge of water supply and sanitary service (including solid waste collection) with particular reference to building and conceptual design technique and drawing

1. **Water Supply System** (1 hour)
 - 1.1 Introduction
 - 1.2 Objective Of Water Supply
 - 1.3 Water Supply And Public Health

2. **Introduction to Water Sources** (2hours)
 - 2.1 Water Cycle, Type Of Sources, Surface Water Sources, (River, Pond, Lake)
 - 2.2 Ground Water Sources, (Well, Tube Well, Artesian, Springs, Stone Shower)
 - 2.3 Rain Water Harvesting, Fog Collection& conservation pond.

3. **Water Supply System**
(Distribution System And House Water Plumbing) (5hours)
 - 3.1 Service connection
 - 3.2 Service pipes, size determination, material use for service pipes size of service pipes
 - 3.3 Appurtenances (water meters, gate valves, globe valve, ball valve, reflux valve, safety valve, air release valve, drain valve, fire hydrant, bib cock, stop cock, bends, tee, elbow, union, cross, reducer and enlarger, shower, storage tank, overflow, wash out etc.)
 - 3.4 Head loss on pipe and fittings, leakage check of pipe system
 - 3.5 Hot and cold water supply in building, central heating system, local (instantaneous) heating system (geysers, solar etc.)
 - 3.6 Maintenance of building plumbing

4. **Estimation Method of Water Quantity** (4 hours)
 - 4.1 Population forecasting, water requirement for various purpose
 - 4.2 Water demand., variation on demand, peak demand, factors affecting on demand, socio economic factor on demand
 - 4.3 Water supply for private and public places
 - 4.4 Water storage, classification, size determination of tank/ reservoir.

- 5. Assessment of Water Quality (3hours)**
- 5.1 Impurities, types and their effect, domestic purification process , water quality standard (WHO), wholesome water, potable water, contaminated water
 - 5.2 Water treatment (introduction only), need of treatment (screening, sedimentation, filtration, disinfection, aeration, softening, miscellaneous process)
- 6. Sanitary System (2hours)**
- 6.1 Introduction
 - 6.2 Objective of sanitation
 - 6.3 Sanitation, environment and public health
- 7. Introduction to Sewage Collection and Treatment (4hours)**
- 7.1 Sewage disposal from isolated , apartment or group housing
 - 7.2 Septic tank, soak pit, design and construction
 - 7.3 Collection and disposal of dry refuse, night soil and sullage.
 - 7.4 Pit latrine, VIP latrine, Privy.
 - 7.5 Eco-Sanitation concept of reuse of waste water, constructed wetland CW.
 - 7.6 Rain water disposal from roof and court yard, roof drainage, rain water pipe location, open and close drain and disposal (calculation of rain water runoff from roof and court) , surface water drainage, road drainage, drainage layout..
- 8. Pipes, Appliances Fittings and Appurtenance (3hours)**
- 8.1 Soil appliances, waste water appliances, traps, pipe work, pipe material, pipe duct, manhole; gratings., wash basin, kitchen sink, bath tub, flushing cistern, water closet, urinals, commode, traps, bends, vent pipe, inlets, catch pits, clean outs, man holes, drop manholes, flushing device , grease and oil traps.
- 9. Introduction To Rural Sanitation (4 hours)**
- 9.1 Provision of safe and portable water sources
 - 9.2 Collection and disposal of dry refuse, night soil and sullage
 - 9.3 Pit latrine, VIP latrine , privy
 - 9.4 Eco sanitation
- 10. Introduction to Solid Waste Management (2hours)**
- 10.1 Solid waste collection, disposal system, refuse collection, chute, container location,
 - 10.2 Incineration, composting of solid waste, biogas generation.
 - 10.3 ISWM 5 R Principles

Practical (Drawing) (30 hours)

- 1. Site Plan : showing manhole, septic tank, soak pit, water reservoir

2. Detail Plan: lay out diagram of water supply system and layout of sewerage system
3. Floor Plan : kitchen and toilet showing appliances and appurtenances
4. House plumbing layout system
5. Miscellaneous Detail: septic tank, soak pit, water reservoir, overhead tank, pipe lay out, sedimentation tank, filtration, screening, drainage system, different appliances, fitting and appurtenance, rain water collections from different types building, solar heating
6. Schematic diagram after site visit: partial complete or undergoing construction project. rain water collection system installed building,
7. Solid Waste Collection Container Lay Out Map, Chute From High Rise Building

Practical Assignments:

S. No	Units	No. of Sheets	Marks
1	1	2	6
2	2	2	6
3	3	2	6
4	4	2	6
5	5	2	6
6	6	2	6
7	7	1	3
8	8	2	6
Total		15	45 + 5

References:

1. Birdie, G.S. And Birdie, J.S, "Water Supply and Sanitary Engineering", Dhanapat Rai & Sons Publishers, NaiSarak, Delhi- 110006, India.
2. Panchadhari, A.C., "Water Supply and Sanitary Installations", New Age International Publishers Limited, India.
3. Barry, R, "The Construction of Building (Volume 5)", Building Services, Affiliated East- West Press Pvt. Ltd., New Delhi

BUILDING SERVICES II**EE 604**

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : III
 Part : I

Course Objective:

To provide basic concept and knowledge of electrical system and design the illumination, power circuits, safety and protection as per standard requirement.

- 1. Basic Concept of Electric System and Its Terminology (8 hours)**
 - 1.1 Concept of Electric Current and Voltage
 - 1.2 Electric Circuits
 - 1.3 Resistance
 - 1.4 Ohm's Law and Kirchhoff's Law
 - 1.5 Open and Short Circuits
 - 1.6 Single and Three Phase a.c. Circuits
 - 1.7 Electrical Power and Energy
 - 1.8 General Description of Electrical Distribution System, Transformers, Service Panels (MDB, SDB) etc.

- 2. Artificial Lighting System (8 hours)**
 - 2.1 Introduction
 - 2.2 Terms Used in Lighting System
 - 2.3 Laws of Illumination
 - 2.4 Types of Lamps and Lighting Fixtures
 - 2.5 Types of Lighting Schemes
 - 2.6 Lighting System Consideration for different Occupancies
 - 2.7 Design of Lighting Schemes
 - 2.8 Methods of Lighting Calculation
 - 2.9 Factory Lighting , Street Lighting & Flood Lighting

- 3. Safety and Protection in Electric System (8 hours)**
 - 3.1 Introduction
 - 3.2 Operation and Construction of Fuses, MCB and MCCB
 - 3.3 Earthing for Electrical Equipment and Appliances
 - 3.4 Electric Shock Hazards
 - 3.5 Introduction to Lightning Arrestor

- 4. Electrical Installation (6 hours)**
 - 4.1 Introduction
 - 4.2 Types of Wiring System
 - 4.3 General Rules for Wiring System and Code of Practice
 - 4.4 Determination of Light sub-circuit, power sub-circuit & Total Load

- 4.5 Determination of Size of Conductor
- 4.6 Electrical Installation for Electrical Heating System, Air-conditioning System, lifts, escalators and pumps etc.

Practical:

1. Introduction to wiring accessories such as – switches, socket, distribution board etc, protective devices such as – fuse, MCB, MCCB etc. their construction, function and application.
2. Preparing Electrical Lay-out and details for commercial Complex or Apartment Building
3. Conducting Market Study and Collecting, informative brochures and Specification on various product available about electrical lamp, appliances and equipment
4. Application of above studies in preparing design and details in the design done in current terms.

References:

1. Jain & Jain “ ABC of Electrical Engineering”, Dhanpat Rai Publishing Company, New Delhi.
2. J.B. Gupta “ Electrical Installation Estimating and Costing”, S.K. Kataria & Sons, New Delhi
3. G.L. Wadhwa “ Generation, Distribution and Utilization of Electrical Energy”, New Age International (P) Limited, India
4. Bhuvanesh A Oza, Nirmal Kumar C Nair, Rashesh P Mehta and Vijaya H Makwana, “ Power System Protection and Switchgear”, Tata McGraw Hill Education (P) Limited, New Delhi

DESIGN STUDIO VI

AR 651

Lecture : 0
 Tutorial : 0
 Practical : 12

Year : III
 Part : II

Course Objective:

- To be able to establish appropriate structural system, use of materials and environmental controls in design.
- Analyze site situations and to establish appropriate land use, Zoning and incorporation of landscaped outdoor spaces.
- Understanding architectural character of public building, visibility & statements.
- Incorporating building services in design process.

Exercise No./Hours	Suggested Project	Content of submission	Marks
174 Hours Weeks	Industrial Building/ Building with large span structure- Sports Hall/ Exhibition Halls/Auditorium	Master Plan, Plan, Section, Elevations, Construction Details. Interior Drawing, Perspective Drawing/s Model	240
6 Hours	Time Problem – Design of any of above facilities (Project brief provided)	Conceptual Drawings in Free Hand Sketches	60

Evaluation Schedule for each Exercise:

Week/Hrs	Stage	Marks	Remarks
4 48 Hrs	Literature & Case Studies	40	Inclusive of presentation of case study
4 48 Hrs	Conceptual Design	80	
6.5 78 Hrs	Final Design	120	Inclusive of Final Presentation
	Total	240	

References:

1. Time Savers Standard
2. Neufert Architectural Design Data

URBAN AND SETTLEMENT PLANNING

AR 652

Lecture : 4

Tutorial : 0

Practical : 0

Year : III

Part : II

Course Objectives

To familiarize the students with the social, economic and organizational perspectives at national regional and local levels as a context in which architectural product is likely to be placed. This will also provide the necessary background for making informed choices for further studies in related specialized disciplines. Special reference will be made to the problems of urbanization in Nepal

Specifically it aims to study about various concepts of planning and get exposed to the various aspect of planning process

Course Topics:

1. Introduction

(4 hours)

- 1.1 Definition and concept of Planning, elements of human settlement- role of man and society in.
- 1.2 The growth and decay of human settlements, planning objectives, benefits
- 1.3 Planning as interdisciplinary subject
- 1.4 Historical and traditional settlements, Urban and rural characters of settlements, squatter settlements -examples from Nepal
- 1.5 Concept of urban and rural settlement planning

2. Urban/City Planning

- 2.1 Planning concepts (10 hours)
 - 2.1.1 Morphology of the city and social/economical/political and technological processes in city growth
 - 2.1.2 Introduction to theoretical models of planning contribution to planning thought- Sir PatricGedds, Sir Ebenezer Howard, CA Perry, Le Corbusier, Doxiadis, Lewis Mumford- Relevance to Nepali Planning context
- 2.2 Development Plans (14 hours)
 - 2.2.1 Various types of plans- National plan-regional plan-master plan-structure plan-zonal development plan-local development plan -their general scope, content, planning process and planning guidelines

- 2.2.2 Land-use Planning - comprehensive land use plan and its functions
- 2.2.3 Subdivision and zoning byelaws
- 2.2.4 Steps needed to develop land-use plan
- 2.3 Planning Practice in Nepal (4 hours)
- Historical over view on Nepalese Planning Practice-both Rural and Urban Planning
 - Contemporary planning practice - comprehensive planning, participatory planning-examples
 - Planning Institutions and Planning Issues
3. Rural Planning (4 hours)
- 3.1 concept of rural planning
- 3.1.1 Rural planning, development planning, approaches to rural development, integrated rural development, urbanization and rural development, rural service centers
- 3.1.2 Nepal's experience in rural development- growth axes and IRD
- 3.1.3 Urbanization in Nepal and linkages to rural development (Urban Rural relations)
4. Essential Features of Urban/Rural Planning (10 hours)
- 4.1 Demography/population studies, population composition, structure, characteristics
- 4.2 Employment-basic and non-basic form of employment
- 4.3 Utilities and services- water supply/drainage, sewerage/sanitation, electricity, transportation-types and patterns
5. Urban and Rural Planning (8 hours)
- 5.1 Essential features of urban/rural planning
- For data collection- Survey (sampling technique, types of surveys), Statistical analysis -mean/mode/medium, standard deviation, corrections, regression, variance
 - Population projection, growth rate calculation, demand forecasts and calculation of carrying capacity
6. Case Study (6 hours)
- Case Study of Planning related problem and its solution.

References:

1. The Urban Pattern
2. Lewis Keeble, "Principles and Practice of Town and Country Planning"
3. Kathmandu Valley Physical Development Plan, 1968
4. HK Wolff & P. R. Pant, "Social Science Research and Thesis Writing", Buddha Publishers, Putalisadak
5. Dr.Jibgar Joshi, "Sustainable Urban Development"
6. Dr.Harkha Gurung, "Dimensions of Development"

BUILDING SCIENCE II

AR 654

Lecture : 3

Tutorial : 1

Practical : 0

Year : III

Part : II

Course Objective:

- To introduce the concept of architectural lighting, acoustics and Energy in relation to architectural design
- To deal with the use of architectural lighting, acoustics and Energy for comfort and security in building and built up environment

1. Architectural Lighting

- | | | |
|-----|--|-----------|
| 1.1 | Introduction of Architectural lighting | (2 hours) |
| | 1.1.1 History of architectural lighting | |
| | 1.1.2 Sources of lighting – Natural & Artificial | |
| 1.2 | Day lighting | (3 hours) |
| | 1.2.1 Properties of Daylight | |
| | 1.2.2 Photometric quantities | |
| | 1.2.3 Day light Factor | |
| | 1.2.4 Design Sky concept | |
| | 1.2.5 Light & glare | |
| 1.3 | Day light Design | (4 hours) |
| | 1.3.1 Building shape & layouts | |
| | 1.3.2 Location, shape & size of openings | |
| | 1.3.3 Orientation of building & openings | |
| | 1.3.4 Design Sky | |
| 1.4 | Artificial lighting Design | (4 hours) |
| | 1.4.1 Objectives of artificial lighting design | |
| | 1.4.2 Electric light sources | |
| | 1.4.3 Interior lighting design | |
| | 1.4.4 Illumination design & calculation | |
| 1.5 | Principles of Architecture lighting | (3 hours) |
| | 1.5.1 Architectural lighting philosophy/ | |
| | 1.5.2 Le Corbusier – Ron champ church | |
| | 1.5.3 Louis Kahn – Kimbell art gallery, Sansadbhawan | |

2. Architectural Acoustics

- | | | |
|-----|------------------------------------|----------|
| 2.1 | History of Architectural Acoustics | (1 hour) |
|-----|------------------------------------|----------|

- 2.1.1 Ancient open air theatre - Greek and Roman
- 2.1.2 Ancient open air theatre - Dabali of Nepal
- 2.2 Basic concepts of architectural acoustics (3 hours)
 - 2.2.1 Sound and vibration
 - 2.2.2 Properties of sound
 - 2.2.3 Classification of Sound – Airborne and Impact
 - 2.2.4 Measurements of sound intensity level
 - 2.2.5 Audible range of sound
 - 2.2.6 Acceptable indoor noise level
 - 2.2.7 Impact of sound according to time, environment and settlement
- 2.3 Room Acoustics (5 hours)
 - 2.3.1 Reaction of sound - Absorption, Reflection & Transmission
 - 2.3.2 Sound insulation and transmission loss
 - 2.3.3 Sound absorbents
 - 2.3.4 Common acoustic problems in a room
 - 2.3.4.1 Echoes
 - 2.3.4.2 Reverberation
 - 2.3.4.3 Sound foci
 - 2.3.4.4 Dead spots
 - 2.3.4.5 Insufficient loudness
 - 2.3.4.6 External noise
- 2.4 Sabine-Eyring Reverberation – Time Equation (3 hours)
 - 2.4.1 Reverberation Time (RT)
 - 2.4.2 Optimum Reverberation Time (ORT)
 - 2.4.3 Calculation of ORT
- 2.5 Acoustic Design of a Hall (3 hours)
 - 2.5.1 Factors affecting for good acoustics of a hall
 - 2.5.1.1 Site selection & planning
 - 2.5.1.2 Shape and size
 - 2.5.1.3 Audience seating arrangement
 - 2.5.1.4 Treatments of interior surfaces
 - 2.5.1.5 Sound path & RT
- 2.6 Noise & its Impact (3 hours)
 - 2.6.1 Types of Noise – External & Internal
 - 2.6.2 Noise impact to human being
 - 2.6.3 Noise control techniques
 - 2.6.3.1 Noise control techniques for external noise
 - 2.6.3.2 Urban planning according to noise level
 - 2.6.3.3 Orientation, planning & designing of a building
 - 2.6.3.4 Noise screening – Natural & artificial

2.6.3.5 Sound reduction by construction technology

2.6.3.6 Noise control techniques for internal noise

- 2.7 Sound Insulation (2 hours)
- 2.7.1 Mass law
- 2.7.2 Vertical barrier – wall & partition
- 2.7.3 Horizontal barrier – floor & ceiling

3. Energy (9 hours)

- 3.1 Concept of Energy –Renewable & non- Renewable Energy
- 3.2 Energy situation in the world & Nepal
- 3.3 Active methods of energy conversion for Heating, Cooling & Lighting in a building
- 3.3.1 Solar collector, Solar water heater, dryer etc.
- 3.3.2 PV Cell
- 3.4 Passive methods of energy conversion for Heating & Cooling in a building
- 3.4.1 Orientation, planning, color, texture, materials, technology
- 3.4.2 Direct, Indirect & Isolated gain
- 3.4.2.1 Glazed openings, wall, roof, space etc
- 3.4.3 EAT system, wind tower, etc

Internal Assignments:

20 Marks

1. Calculation of Day light factors
2. Design & calculation of artificial illumination in a room
3. Calculation of RT of a hall
4. Observation and study of Day lighting design of various buildings (Case study)
5. Observation and study of Artificial lighting design of various buildings(Case study)
6. Observation and study of Energy efficient design of various buildings(Case study)
7. Report of Lighting, Acoustics & Energy (from above case study)
8. Unit Test

References:

1. Koenigsberger, Ingersoll, "Manual of Tropical Housing and Building", Orient Longman, Chennai, India,
2. M. David Egan, "Concepts in Architectural Acoustics", McGraw- Hill book company, USA
3. S V Szokolay, A krishan, "Climate Responsive Architecture", Tata McGraw-Hill, New Delhi, India,
4. Er. B Pahari, "Passive Building-Concept & Design", KEC, Lalitpur, Nepal

5. B.C. Punmia, 1984 "Building Construction (Acoustics)", Laxmi publication, New Delhi, India,
6. N.K.Bansal&K.Rijal, "Passive Solar Building in the Mountains", ICIMOD, Nepal
7. K.Rijal, "Energy use in Mountain areas", ICIMOD,Nepal
8. Dr. V. Gupta 1984"Energy & Habitat", Wiley Eastern Limited, New Delhi, India
9. M Majumdar 2001 "Energy- efficient buildings in India", TERI, New Delhi, India
10. Different websites ([www. Renewable energy](http://www.Renewable energy),)

STRUCTURES III

CE 657

Lecture : 3
 Tutorial : 1
 Practical : 0

Year : III
 Part : II

Course Objective:

To understand the basic design procedures and calculations for simple structural components in Timber, Steel and Concrete.

1. **Introduction to Foundation Engineering** (6 hours)
 - 1.1 Nomenclature of different soil types
 - 1.2 Basic physical properties of soils
 - 1.3 Introduction to soil exploration methods
 - 1.4 Use, type and tentative proportioning of retaining walls
 - 1.5 Footing and Foundations - types
 - 1.6 Guidelines for depth of foundation, dimensioning of footing based on given values of safe bearing capacity of soils.
 - 1.7 Introduction to raft with basement, pile foundations.

2. **Properties of Structural Materials** (4 hours)
 - 2.1 Structural timber: types and mechanical properties
 - 2.2 Masonry: types- bricks block, stone with different types of mortar
 - 2.3 Structural steel: mechanical properties, stress-strain curve of mild steel
 - 2.4 Review of concrete and reinforced concrete properties
 - 2.5 Use and suitability of different structural materials in buildings

3. **Timber Structures** (6 hours)
 - 3.1 Design of timber with various components, their structural functions.
 - 3.2 Types of beams, columns and foundations, including joints and connection.
 - 3.3 Types of timber roof trusses with joints and connections.
 - 3.4 Timber floors.
 - 3.5 Design of simple timber trusses, timber beams and timber columns.

4. **Masonry Structures** (4 hours)
 - 4.1 Structural properties of masonry components.
 - 4.2 In plane and out of plane behavior of masonry walls.
 - 4.3 Slenderness ratio of masonry wall.
 - 4.4 Design principles of masonry structures.
 - 4.5 Design of simple masonry walls, piers, and foundations.

5. Structural Steel (10 hours)

- 5.1 Design in structural steel with various components, their structural functions.
- 5.2 Standard and built-up sections of structural steel.
- 5.3 Riveted and welded connections: simple connections, and subjected to moments.
- 5.4 Members subjected to axial compression: steel struts and columns, ties.
- 5.5 Beams: steel beams and built-up sections
- 5.6 Introduction to steel trusses and industrial buildings.
- 5.7 Bases and footings: types, design of slabs and gusseted bases.

6. Structural Concrete (15 hours)

- 6.1 Properties of concrete and reinforcing steels
- 6.2 Design approaches
- 6.3 Limit State Design of reinforced concrete sections for bending and shear
- 6.4 Bond strength and development length
- 6.5 Serviceability Limit States of deflection and cracking
- 6.6 Design of R.C. beams, one-way slabs, L and T beams, two-way slabs, columns and footing for isolated columns
- 6.7 Detailing of reinforcement

References:

1. Dayaratnam, P., "Reinforced Concrete Structures", Oxford & IBH Publishing Co.
2. Jain, A.K., "Reinforced Concrete – Limit State Design", Nem Chand Bros.
3. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill.

SPECIFICATIONS

CE 658

Lecture : 2
Tutorial : 0
Practical : 0

Year : III
Part : II

Course Objective:

To understand the purpose, type and importance of specifications, typical specification writing for material and workmanship and performance

1. **Introduction** (6 hours)
 - 1.1 Definitions
 - 1.2 Purpose of Specifications
 - 1.3 Types of Specifications
 - 1.4 Importance of Specifications

2. **Method of Writing Detailed Specifications** (4 hours)

3. **Detailed Specifications Writing for Various Items of Works** (20 hours)
 - 3.1 Site Works
 - 3.2 Structural Works
 - 3.3 Finishing Works
 - 3.4 Equipment
 - 3.5 Electrical and Mechanical Works

References:

1. G.S. Berdie, "Text Book of Estimating and Costing"
2. Standard Specifications of Building Project

ESTIMATING AND COSTING

CE 659

Lecture : 2
Tutorial : 0
Practical : 2

Year : III
Part : II

Course Objective:

To provide the knowledge of estimating and costing, rate analysis and method of valuation, and to practice the methods of doing both approximate and detailed estimates

Course Topics:

1. **Introduction** (3 hours)
 - 1.1 General
 - 1.2 Units of Measurement and Payments for Various Items of Building
 - 1.3 Works and Materials
 - 1.4 Purpose of Estimating
 - 1.5 Requirement of Estimating
 - 1.6 Methods of Measurement of Building Work
 - 1.7 Sub Head of Various Items of Building Work
 - 1.8 Various Methods of Taking out Quantities
 - 1.9 Abstracting Bill of Quantities
2. **Types of Estimates** (3 hours)
 - 2.1 Approximate Estimate
 - 2.2 Detailed Estimate
 - 2.3 Revised Estimate
 - 2.4 Supplementary Estimate
 - 2.5 Annual Repair and Maintenance Estimate
 - 2.6 Extension and Improvement Estimate
 - 2.7 Complete Estimate
 - 2.8 Split up of the Cost of Building Works
3. **Analysis of Rates** (6 hours)
 - 3.1 Introduction
 - 3.2 Purpose of Rate Analysis
 - 3.3 Requirement of Rate Analysis
 - 3.4 Factors Affecting the Rate Analysis
 - 3.5 Procedure of Rate Analysis for Building Works
 - 3.5.1 Water Supply and Sanitary Works.
4. **Valuation** (6 hours)
 - 4.1 Introduction
 - 4.2 Purpose of Valuation

- 4.3 Principles of Valuation
- 4.4 Terms Used in Valuation
- 4.5 Various Method of Determining the Value of Property
- 4.6 Method of Valuation Report Writing

5. Detailed Estimate

(8 hours)

- 5.1 Estimate for a Single Room Building
- 5.2 Estimate for a Two Room Building
- 5.3 Estimate of Earth Work in Road Construction by Three Methods

6. Computer Application

(4 hours)

- 6.1 Estimates for One Room Building
- 6.2 Valuation of Property
- 6.3 Rate Analysis

Tutorial/Practical:

- 1. Approximate estimate of a building project
- 2. Detailed estimate of a one storied residential building
- 3. Valuation of a property

References:

- 1. A.K. Updhaya, "Civil Estimating, Quantity Surveying and Valuation", Katson Publishing House, Ludhiana.
- 2. M. Chakerborti, "Estimating and Costing"

BUILDING ECONOMICS

SH 653

Lecture : 2

Tutorial : 0

Practical : 0

Year : III

Part : II

Course Objectives:

- To acquaint the students with some of the basic concepts and tools used to carry economic and financial analysis of building/engineering projects
- To provide students with a more interdisciplinary approach to project planning, management and evaluation techniques

- 1. Economic Principle** (8 hours)
 - 1.1 Economic equilibrium, demand, supply, production
 - 1.2 Welfare economics
- 2. Planning the Study** (4 hours)
 - 2.1 Identifying goals and objects
 - 2.2 Organizing the study
 - 2.3 Administering the study
 - 2.4 Planning the budget
- 3. Implementation/Evaluation Techniques** (14 hours)
 - 3.1 Linear programming
 - 3.2 Cost/Benefit Analysis
 - 3.3 Direct/Indirect cost
 - 3.4 Tangible/Intangible benefit
 - 3.5 Break even analysis
 - 3.6 Time value of money
 - 3.7 Simple payback method
 - 3.8 Payback with interest
 - 3.9 Present value method
 - 3.10 Rate of return
 - 3.11 B/C ratio calculation
 - 3.12 Internal rate of return
- 4. Socio Economic Data** (2 hours)
 - 4.1 Demographic data
 - 4.2 Economic data
 - 4.3 Legal data
 - 4.4 Social data

5. Data Management**(2 hours)**

- 5.1 Collection of data
- 5.2 Processing of data
- 5.3 Analysis of data

References:

1. Price Gittinger, "Economic Analysis of Agricultural Project", A Work Bank Publication. John Hopkins University, Baltimore.
2. Otto J. Helweg, "Water Resources Planning and Management", John Wiley and Sons Publication.
3. Henderson, J.M. and Quandt, R.E, "Micro-Economic Theory", McGraw Hill Company.
4. D.T, Ravindra, A and Solberg, J.J. "Operations, Research Principals and Practices", John Wiley and Sons Publications.
5. Jhingan, K.L. & Shrestha, B.P, "The Economics of Development and Planning"
6. Pigou, A.C. & Nepal, Dr. G, "The Economics of Welfare"
7. Lekhi, R .K, "The Economics of Development and Planning", Kalyani Publishers
8. Bajracharya, Prof. P, "Introduction of Economics"
9. Millan, Mac, "Theory of Price"
10. Chopra, P.N, "Macro Economics", Kalyani Publishers
11. National Planning Commission
12. Ahuja, H.L, "Advanced Economic Theory (Micro Economic Analysis).", Chand and Company limited, Ram Nagar New Delhi
13. Ratna Man Dangol, Manik Lal Pradhan, "Cost and Management Accounting"
14. Silu Bajracharya, Rabindra Bhattarai, "Financial Management"

SOCIOLOGY

SH 652

Lecture : 2

Tutorial : 0

Practical : 0

Year : III

Part : II

Course Objectives

- To familiarize students with basic concepts of sociology
- To understand the social dimension of architecture

1. Introduction (2 hours)

- 1.1 Definition and scope of sociology
- 1.2 Sociology and architecture-Interdisciplinary Relation
- 1.3 Urban and rural sociology

2. Man and the Society (4 hours)

- 2.1 Types of society, Society and social environment- meaning of social environment, difference between physical and social environment
- 2.2 Socialization: Definition, Process and factors of socialization
- 2.3 Social Interaction: meaning, socio-cultural processes
- 2.4 Social change: meaning and factors of change

3. Social Structure (8 hours)

- 3.1 Social structure: meaning, elements, types/kinds
- 3.2 Social institution: kinds/types and functions
- 3.3 Social system: concept and elements of social system
- 3.4 Social Group: meaning, types; difference between group and community
- 3.5 Meaning and forms of family, marriage, caste and kinship system, gender Social structure in Nepal

4. Culture and Civilization (2hours)

- 4.1 Meaning of culture, civilization (Paleolithic, Bronze and modern civilization & culture)
- 4.2 Introduction to structure of culture: cultural traits, cultural complex, cultural pattern Cultural diffusion, transmission, values, norms

5. Social Philosophy of life in Nepal (4 hours)

- 5.1 Pattern of settlement in villages & rural areas
- 5.2 Population pressure, settlement pattern and land use in urban areas.
- 5.3 Uses of indigenous construction materials- merit / demerits
- 5.4 Functional & aesthetic dimension of Ethnic houses of Nepal.

6. Social Dimension of Architecture (2hours)

- 6.1 Social/cultural dimension of space (void)
- 6.2 Socio cultural dimension of built form (mass)
- 6.3 Impact of social organization, social change in Architecture

7. Method in Social Research (8 hours)

- 7.1 Study of social dimension of Nepalese architecture through research
- 7.2 Research definition and types
- 7.3 Mini Case study research
 - Definition, research essentials, literature review
 - Research design approach- research units and samples, identification of sources of data, selection of data collection methods
 - Execution of data collection on field-various alternative methods- sample survey, interviews, group discussion, ethnographic description, direct observation, participant observation
 - Analysis- organization of data, basic statistical methods, qualitative analysis, reliability and validity of data collection
 - Report writing technique- research report types, style, body of report, referencing and citations

Assignment: Evaluation on Submitted Report on case study **10 marks**

References

1. Inleles, Alex, "What is sociology?", Prentice Hall, EEE
2. Berger Petter, "Invitation to Sociology", Penguin Books.
3. Beattie John, "Other Cultures", London, Cohen and West
4. HK Wolff & P. R. Pant, "Social Science Research and Thesis Writing", Buddha Publishers, Putalisadak
5. Edward T. Hall, "The Hidden Dimension", Anchor Books, Newyork
6. Nicholos Abercrombie et. al., "The Penguin Dictionary of Sociology", Penguin Books, London
7. Vidhya Bhusanet. al., "An introduction to Sociology", Kitab Mahal, Delhi

PROFESSIONAL TRAINING (PRACTICUM)

AR 701

Lecture : 0
Tutorial : 0
Practical : 30

Year : IV
Part : I

Course Objectives:

- To emphasize the application of principles, techniques and methods of designing, drafting, constructing etc, in practice, from the lessons learnt in previous semesters and consolidate their knowledge.
- To focus on problem based practical learning through experience in architectural/ engineering/ planning fields in the current market practice.

Instructions and Requirements:

- During this semester students will be required to register themselves as a trainee to assist architects/ engineers/ planners in an architectural firm/ Construction Company or other related offices of governmental/non-governmental organization approved by the department.
- The student will compulsorily identify their training places/offices/firms/ companies before the close of 3rdyr/ II Part. The work must be done in design offices and site supervision alone will not be accepted as sufficient work.
- The area of work could be architectural design, urban design and planning, conservation of buildings and urban conservation and studies or mix of these areas etc. Estimating, costing and preparation of tender documents, specification, preparation of working drawings including structural and services drawing, site supervision, property valuation and other related works to the architectural discipline.
- Log books will have to be maintained by students and counter-signed by the principal of the firm/agency and 90 working days is mandatory to fulfill the course.
- The department will allocate departmental supervisors and the accepting firm/ company / office will appoint their supervisor from among its architects/ engineer/ planner etc to assist students in the learning process.

Supervision & Evaluation:

1. The modality of supervision during the course of practicum shall be as per the program fixed by the department.
2. Evaluation and marks distribution:

S.No.	Stage	Timing	Marks
1	Preliminary evaluation	5th/6th Week	25
2	Mid-term evaluation	11th/12th week	50
3	Final evaluation by employing agency/firm	12th/13th week	100
4	Final evaluation by department- Viva Voce	14th/15th week	75
5	Final report		50
Total			300

ARCHITECTURAL CONSERVATION

AR 751

Lecture : 4
 Tutorial : 0
 Practical : 0

Year : IV
 Part : II

Course Objective:

- To highlight the theory and practice of conservation.
- To sensitize the students with the issues pertaining the conservation of cultural property
- To familiarize with their problems and the approaches in conservation.
- To focus on limitations of maintenance, repair and restoration.

1. Conservation (12 hours)

- 1.1 Definition
- 1.2 History
 - 1.2.1 Western-Conservation in ancient, medieval and modern periods
 - 1.2.2 Nepalese- Conservation in ancient, Lichhavi, Malla, Shah & Rana periods.
- 1.3 Philosophy
 - 1.3.1 Authenticity- Materials, Form, Structure
 - 1.3.2 Principles of conservation – Reversibility, Minimum intervention, Maximum retention

2. Cultural Property (8 hours)

- 2.1 Phenomenon of deterioration – Natural and human action.
- 2.2 Needs to repair, maintain and conserve values in conservation – Emotional , Historic, Archeological and Social values

3. Methodologies of Conservation (12 hours)

- 3.1 Inventory
- 3.2 Inspection
- 3.3 Documentation and Interventions- Degrees and Strategies
 Prevention of deterioration, Preservation, Consolidation, Restoration, Rehabilitation, Reintegration, Anastylis, Renovation, Conjectural restoration, with examples from national and international cases: Hanuman Dhoka Palace, Bhaktapur Development Project, Renovation of 55 windows palace.

4. Materials and Techniques (Traditional vs modern) (8 hours)

- 4.1 Traditional materials and techniques of conservation in Nepal eg; walls and facing, floors and joist replacements, roof structure and Jhingati, Dalans and column/beam sets, Doors & windows, mud and mud mortar, problems in wood works and brick works in traditional

buildings.

- 4.2 Modern materials and techniques in use, roof tar, water proofing, damp proofing, problems in innovation and practice, examples Mayadevi temple at Lumbini, Keshav Narayan Chowk at Patan, Chysilin Mandap etc.

5. Historic Buildings (8 hours)

- 5.1 Rehabilitation
5.2 Adaptive Use

6. Design and Planning Control (12 hours)

- 6.1 Ancient Monuments Preservation act 1955 and revisions
6.2 World Heritage Site, criteria and procedure for nomination and inscriptions.
6.3 General Bye-laws and specific building control norms applied in monument Zones in Kathmandu Valley WHS, Problems and issues, conservation of urban cultural landscape, heritage spaces and cities, listing in WHS in danger .
6.4 Management plan and regulations of design/construction.

References:

1. Feilden, Bernard M, "Conservation of Historic Buildings", London.
2. Fitch, James Marston, "Historic Preservation", University of Virginia Press.
3. Jokiletho Jokka, "A History of Architectural Conservation", University of York
4. Parajuli, Yogeshwor, "Bhaktapur", Bhaktapur Development Project Board.
5. Sanday, John , "Building Conservation in Nepal", UNESCO, Paris,
6. Sanday, John, "Hanuman Dhoka", AARP, London.
7. Sanday, John, "Monuments of the Kathmandu Valley", UNESCO, Paris.

DESIGN STUDIO VII

AR 752

Lecture : 0
 Tutorial : 0
 Practical : 12

Year : IV
 Part : II

Course Objective:

- Understanding urban spaces and process of improvement and implementation of urban planning knowledge acquired in previous semester
- Understanding built form and its visual and environmental impact to surrounding areas.

Exercise No./Hours	Suggested Project	Content	Marks
180 Hours	Planning Projects Incorporating Design of (any one of the following): Urban housing/Group Housing Urban Redevelopment Planning of New Towns Planning of Urban Areas	Master Plan with landscape, Plans, Sections, Elevations, Perspective /3 –D Animation and Block Model	300

Evaluation Schedule for Project work:

Week/Hrs	Stage	Marks	Remarks
4 48 Hrs	Site Study (Literature & Case Studies)	40	Inclusive of presentation of case study
4 48 Hrs	Conceptual Design	80	
7 84 Hrs	Final Design	180	inclusive of final presentation
Total		300	

References:

1. Time Savers Standard
2. Neufert Architectural Design Data

CONSTRUCTION MANAGEMENT

AR 753

Lecture : 4

Tutorial : 0

Practical : 0

Year : IV

Part : II

Course Objective:

To address the pertinent issues and approaches to be considered during construction so that the Architect is expected to realize his/her responsibility in undertaking and in the implementation of a construction project.

- 1. Introduction to Construction Management (2 hours)**
 - 1.1 Management: need and necessity
 - 1.2 Role of Architects in Construction Management
- 2. Contract Administration (10 hours)**
 - 2.1 Understanding Contract Administration and the Architects role
 - 2.2 Procurement Guidelines and selection and criteria
 - 2.3 Terms of Reference and Contract Agreements
 - 2.4 Bid and Contract Documents
 - 2.5 Progress report & billing
- 3. Planning & Scheduling (10 hours)**
 - 3.1 Introduction to planned approaches in construction
 - 3.2 Planning importance and techniques
 - 3.3 Bar or Gantt Charts
 - 3.4 Networking and it's features: critical path diagrams
 - 3.5 S-curve
- 4. Personnel Management (6 hours)**
 - 4.1 Understanding the importance of human resources as a valuable sector
 - 4.2 Human Resource as a valuable sector
 - 4.3 Institution: objectives and goals
 - 4.4 Organization approaches
- 5. Material Management (6 hours)**
 - 5.1 Understanding effective purchasing techniques, material handling and inventory control
 - 5.2 Economic Order Quantity: ascertaining savings
 - 5.3 Best Practice and Quality Assurance
 - 5.4 Proprietary rights
- 6. Quality in Construction (4 hours)**
 - 6.1 Importance of quality construction in design and construction works
 - 6.2 Best Practice and Quality Assurance

- 6.3 Principles of Inspection
- 7. **Maintenance management and Site Equipment** (4 hours)
 - 7.1 Significance of managing site and construction equipment
 - 7.2 Repair and Maintenance
 - 7.3 Maintenance Types
- 8. **Safety** (6 hours)
 - 8.1 Understanding the need to create safe working environment
 - 8.2 Effects of physical, physiological and psychological impacts
 - 8.3 Benefits and Losses
 - 8.4 Standard Practices
 - 8.5 Demolition Works
- 9. **Cost Control** (4 hours)
 - 9.1 Understanding the need for cost control
 - 9.2 Necessity and strategies
- 10. **Financial Management and Accounts** (8 hours)
 - 10.1 Introduction to financial planning and information
 - 10.2 Accounting Policy and Cash Flow
 - 10.3 Assets and Liabilities
 - 10.4 Financial Statements: Balance Sheet and income statements
 - 10.5 Auditing and Taxation

References:

1. R.L. Peurifoy, "Construction Planning, Equipments and Methods"
2. M Verma, "Construction Planning, Equipments and Application"
3. A. Bhattacharya and S. Sorkhel, "Management by Network Analysis"
4. V.N. Vaziram & S.P. Chandola, "Construction Management and Accounts"
5. Punhira & Khandelwall, "PERT & CPM",

COMMUNICATIONS (ENGLISH & NEPALI) SH 754

Lecture : 2	Year : IV	Semester Exam : 40
Tutorial : 2	Part : II	Internal Assessment : 10
Practical : 0		Practical (Lab) : 15

ENGLISH

Course Introduction

This course is designed for the students of bachelor of architectural engineering with the objective of developing all four skills of communication applicable in their professional field.

Course Objective

After completion of this course students will be able to:

- a. comprehend reading materials both technical and semi-technical in nature
- b. develop grammatical competence
- c. be familiar with different varieties of English
- d. write proposals
- e. write reports
- f. write project works
- g. listen and follow description and conversation in native speakers' accent
- h. do discussion in group, deliver talk and present brief oral reports

Unit I: Reading

1. Intensive Reading (5 hours)

- 1.1 Comprehension
- 1.2 Note-taking
- 1.3 Summary Writing
- 1.4 Contextual questions based on facts and imagination

2. Extensive Reading (3 hours)

- 2.1 Title/Topic Speculation
- 2.2 finding theme
- 2.3 Sketching character

Unit II: Contextual Grammar (3 hours)

- 1.1 Sequence of tense
- 1.2 Voice
- 1.3 Subject-Verb agreement
- 1.4 Conditional Sentences
- 1.5 Preposition

Unit III: Varieties of English (5 hours)

- 1.1 Formal/Informal English
- 1.2 Familiar/Polite/More Polite English
- 1.3 Personal/Impersonal English

Unit IV: Writing Technical Proposal (4 hours)

- 1.1 Introduction
- 1.2 Parts of the proposal
 - 1.2.1 title page
 - 1.2.2 Abstract/Summary
 - 1.2.3 Statement of problem
 - 1.2.4 Rational
 - 1.2.5 Objectives
 - 1.2.6 Procedure/Methodology
 - 1.2.7 Cost estimate or Budget
 - 1.2.8 Time management/schedule
 - 1.2.9 Summary
 - 1.2.10 Conclusion
 - 1.2.11 References
 - 1.2.12 Annexes

Unit V: Writing Formal Reports and Project Works (10 hours)**1. Formal Reports** (6hours)

- 1.1 Introduction
- 1.2 Parts and components of formal Report
 - 1.2.1 Preliminary Section
 - 1.2.1.1 Cover page
 - 1.2.1.2 Letter of transmittal/Preface
 - 1.2.1.3 Title page
 - 1.2.1.4 Acknowledgements
 - 1.2.1.5 Table of figures and tables
 - 1.2.1.6 Abstract/Executive summary
 - 1.2.2 Main section
 - 1.2.2.1 Introduction
 - 1.2.2.2 Discussion/Body
 - 1.2.2.3 Summary/Conclusion
 - 1.2.2.4 Recommendations
 - 1.2.3 Documentation
 - 1.2.3.1 Notes (contextual/Footnotes)
 - 1.2.3.2 Bibliography
 - 1.2.3.3 Appendix

2. Writing Project Work (4 hours)

- 2.1 Introduction
- 2.2 Parts

Language lab		15 hours
Unit I: Listening		5 hours
Activity I	General instruction on effective listening, factors influencing listening, and note-taking to ensure attention. (Equipment Required: Laptop, multimedia, laser pointer, overhead projector, power point, DVD, video set, screen)	1 hour
Activity II	Listening to recorded authentic description followed by exercises. (Equipment Required: Cassette player or laptop)	2 hours
Activity III	Listening to recorded authentic conversation followed by exercises (Equipment Required: Cassette player or laptop)	2 hours
Unit II: Speaking		10 hours
Activity I	General instruction on effective speaking ensuring audience's attention, comprehension and efficient use of Audio-visual aids. (Equipment Required: Laptop, multimedia, laser pointer, DVD, video, overhead projector, power point, screen)	1hour
Activity II	Getting students to participate in group discussion on the assigned topics	3 hours
Activity III	Making students deliver talk either individually or in group on the assigned topics (Equipment Required: Overhead projector, microphone, power point, laser pointer multimedia, video camera, screen)	3 hours
Activity IV	Getting students to present their brief oral reports individually on the topics of their choice. (Equipment Required: Overhead projector, microphone, power point, laser pointer multimedia, video camera, screen)	3 hours

Evaluation Scheme

Units	Testing Items	No. of Questions	Type of Questions	Marks Distribution	Remarks
I	Reading	2	short	2 Short questions 4+4 Note or Summary = 6	For short questions 2 to be done out of 3 from the seen passages, an unseen text of about 150 to 200 to be given and asked either to write a summary or make notes.
II	Grammar	1	objective	2	4 questions of fill up the gaps or transformation type to be given
III	Varieties of English	1	objective	4	4 questions to be given to transform from one variety to another or 8 questions to be given just to recognize and label varieties

IV	Proposal writing	1	long	10	A question asking to write brief proposal on technical topic to be given
V	Formal reports and Project works	1	long	10	A question asking to write a brief report or project work on technical topic to be given

Evaluation Scheme for Lab

Units	Testing items	No. of Questions	Type of questions	Marks Distribution	Remarks
I	Listening · description · conversation	1	objective	5	listening tape to be played on any 1 out of description and conversation followed by 10 multiple choice type or fill in the gaps type questions
II	Speaking · group/round table discussion · presenting brief oral report · delivering talk	2	subjective	Round table discussion 5, talk or brief oral report = 5	Different topics to be assigned in groups consisting of 8 members for group discussion and to be judged individually, individual presentation to be judged through either by talk on assigned topics or by brief oral reports based on their previous project work, study and field visit.

Prescribed books

1. Adhikari, Usha, Yadav, Rajkumar, Yadav, Bijaya, ; " A Course book of Communicative English", Trinity Publication, 2012.
2. Adhikari, Usha, Yadav, Rajkumar, Shrestha, Rup Narayan ; "Technical Communication in English", Trinity Publication, 2012.
(Note: Writing section to be covered on the basis of first book and reading part to be covered on the basis of second book)
3. Adhikari, Usha, Yadav, Rajkumar, Shrestha, Rup Narayan ; "Communicative Skills in English", Research Training Unit, IOE, Pulchowk Campus
4. Khanal, Ramnath, "Need-based Language Teaching (Analysis in Relation to Teaching of English for Profession Oriented Learners)", Kathmandu : D, Khanal.
5. Konar, Nira, "Communication Skills for Professional", PHI Learning Private Limited, New Delhi.
6. Kumar, Ranjit, "Research Methodology", Pearson Education.

7. Laxminarayan, K.R, "English for Technical Communication", Chennai; Scitech publications (India) Pvt. Ltd.
8. Mishra, Sunita et. al. , "Communication Skills for Engineers", Pearson Education First Indian print.
9. Prasad, P. et. al , "The functional Aspects of Communication Skills", S.K. Kataria & sons.
10. Rutherford, Andrea J. Ph.D, "Basic Communication Skills for Technology", Pearson Education Asia.
11. Rizvi, M. Ashraf, "Effective Technical Communication", Tata Mc Graw Hill.
12. Reinking A James et. al , "Strategies for Successful Writing: A rhetoric, research guide, reader and handbook", Prentice Hall Upper Saddle River, New Jersey.
13. Sharma R.C. et al., "Business Correspondence and Report Writing: A Practical Approach to Business and Technical communication", Tata Mc Graw Hill.
14. Sharma, Sangeeta et. al, "Communication skills for Engineers and Scientists", PHI Learning Private Limited, New Delhi.
15. Taylor, Shirley et. al., "Model Business letters, E-mails & other Business documents", Pearson Education.

नेपाली खण्ड

पाठ्यांश शीर्षक : वास्तुकला (आर्किटेक्चर) सम्प्रेषणका लागि नेपाली भाषा

अङ्कभार : ३५

आन्तरिक मूल्याङ्कन : ०५ अङ्क,

अर्ध वार्षिक परीक्षा : २० अङ्क

प्रयोगात्मक आन्तरिक मूल्याङ्कन : १० अङ्क

१. पाठ्यांश परिचय
यस पाठ्यांशबाट विद्यार्थीहरूको वास्तुकला (आर्किटेक्चर) विषयलाई नेपाली भाषामा सम्प्रेषण (बोध र अभिव्यक्ति) गर्ने क्षमताको विकास हुने अपेक्षा गरिएको छ।
२. पाठ्यांशको उद्देश्य
यस पाठ्यांशको उद्देश्यबाट विद्यार्थीहरू निम्न लिखित कुरामा सक्षम हुने छन् :
(क) प्रयोजनपरक नेपालीको सामान्य सैद्धान्तिक पहिचान गर्ने
(ख) वास्तुकलाका विविध विषयमा मौखिक सम्प्रेषणका लागि गोलमेच छलफल, मौखिक प्रतिवेदन र प्रवचन गर्ने
(ग) वास्तुकलाका विषय क्षेत्रमा लेखिएका गद्य अभिव्यक्तिहरूको बोध गर्ने
(घ) वास्तुकला विषय क्षेत्रमा प्रस्ताव र प्रतिवेदन लेख्न
३. पाठ्य विषयको विवरण
एकाइ (क) प्रयोजनपरक नेपालीको पहिचान पाठघण्टा : १
 - सामान्य र प्रयोजनपरक नेपालीको भेद
 - वास्तुकला \ इन्जिनियरिङ क्षेत्रमा प्रयोजनपरक नेपालीको महत्त्व
 - वास्तुकला \ इन्जिनियरिङ विषयको सम्प्रेषणका लागि नेपाली भाषा प्रयोगको वर्तमान स्थिति (प्रयास र सम्भावना)
 एकाइ (ख) मौखिक सम्प्रेषण पाठघण्टा : ६
 - वास्तुकला क्षेत्रका समस्यामूलक विषयमा गोलमेच छलफलको अभ्यास
 - कुनै स्थल, भवन आदिको निरीक्षण वा लिखित प्रस्ताव वा प्रतिवेदनको सारांश मौखिक रूपमा प्रस्तुत गर्ने अभ्यास
 - आफूले पढेका कुनै खास विषयमा छोटो प्रवचन गर्ने अभ्यास

एकाइ (ग) प्रयोजनपरक बोध

पाठघण्टा : ७

- वास्तुकला (आर्किटेक्चर) प्रविधिक विषयका गद्य अभिव्यक्तिहरूको बोध, बुँदा टिपोट र संक्षेपीकरणको अभ्यास
- उक्त गद्य अभिव्यक्तिहरूबाट विशिष्ट र प्राविधिक शब्द तथा पदावलीको अर्थज्ञान र प्रयोग गर्ने अभ्यास

एकाइ (घ) प्रस्ताव लेखन

पाठघण्टा : ६

- वास्तुकला विषय क्षेत्रमा अनुसन्धान र परियोजना सञ्चालनका लागि समस्याकथन, उद्देश्य, विधि, समय आदिको व्यवस्थापन सहितको संक्षिप्त प्रस्ताव लेखनको अभ्यास

एकाइ (ङ) प्रतिवेदन लेखन

पाठघण्टा : १०

- प्रगति विवरण, स्थलगत निरीक्षण वा अवलोकन र सम्भाव्यता अध्ययनको विषय प्रवेश (उद्देश्य र विधि सहित), मुख्य विवरण र निष्कर्ष भएको संक्षिप्त प्रतिवेदन लेखनको अभ्यास

४. पाठ्य पुस्तक : 'वास्तुकला सम्प्रेषणका लागि नेपाली भाषा' (कोर्स म्यानुयल) : लेखन सम्पादन - प्रा.लालानाथ सुवेदी
५. मूल्याङ्कनका लागि विशिष्टीकरण तालिका

प्रश्न नम्बर	परीक्षणीय वस्तु	प्रश्नको प्रकृति	प्रश्न सङ्ख्या	अङ्क	थप विवरण
१	प्रयोजनपरक बोध	संक्षिप्त उत्तरात्मक	६	६	निम्न लिखितमध्ये कुनै एक प्रकारको प्रश्न सोध्ने : (क) २०० शब्दसम्मको गद्यांशबाट बोधप्रश्न अन्तर्गत तथ्यपरक, अनुमानात्मक, निष्कर्षात्मक, समीक्षात्मक र प्रकारान्तर कथन सम्बन्धी एक एक प्रश्न र शब्द भण्डारबाट सन्दर्भगत अर्थ वा सन्दर्भपूर्ण वाक्यमा प्रयोगमध्ये एक गरी जम्मा ६ ओटा प्रश्न सोध्ने (ख) २०० शब्दसम्मको गद्यांश दिई त्यसका मुख्य मुख्य चार बुँदाको टिपोट गर्न लगाउने (ग) २०० शब्दसम्मको गद्यांश दिई त्यसको संक्षेपीकरण गर्न लगाउने
२	प्रस्ताव लेखन	निबन्धात्मक	१	६	वास्तुकला विषय क्षेत्रको कुनै एक विषयमा निर्धारित ढाँचामा संक्षिप्त प्रस्ताव लेख्ने प्रश्न सोध्ने
३	प्रतिवेदन लेखन	निबन्धात्मक	१	८	वास्तुकला विषय क्षेत्रको कुनै एक विषयमा निर्धारित ढाँचामा प्रगति विवरण, स्थलगत निरीक्षण वा अवलोकन र सम्भाव्यता अध्ययनमध्ये कुनै एक प्रकारको संक्षिप्त प्रतिवेदन लेख्ने प्रश्न सोध्ने

द्रष्टव्य :

- (१) एकाइ (ख) को 'मौखिक सम्प्रेषण'बाट अङ्क १० को प्रयोगात्मक आन्तरिक मूल्याङ्कन गरिने छ।
- (२) यस पाठ्यक्रम अनुसार शिक्षण गर्न हालको कोर्स म्यानुयल परिमार्जन गरी मौखिक सम्प्रेषण सम्बन्धी सामग्री थप गर्नु पर्ने छ।

STRUCTURES IV

CE 761

Lecture : 3
 Tutorial : 1
 Practical : 0

Year : IV
 Part : II

Course Objectives:

To understand various structural systems for buildings and their structural performance.

1. **Lateral Load Resisting Systems** (14 hours)
 - 1.1 Lateral loads due to earthquake, wind, water and earth pressure.
 - 1.2 Rigid floor diaphragm
 - 1.3 Center of mass and center of rigidity
 - 1.4 Torsionally uncoupled and coupled systems.
 - 1.5 Moment resisting frames, braced frames
 - 1.6 Shear wall system, combination with moment resisting frames
 - 1.7 Structural systems for high rise buildings.

2. **Configuration of Buildings, and its Effect on Structural Performance** (6 hours)
 - 2.1 Structural arrangement plan
 - 2.2 Mass and stiffness distribution
 - 2.3 Plan irregularity
 - 2.4 Elevation irregularity
 - 2.5 Soft storey and weak storey effects
 - 2.6 Code provisions on configurations of buildings
 - 2.7 Effect of irregularity in configuration

3. **Introduction to Shells, Plates and other Structures** (7 hours)
 - 3.1 Structural behavior of different types of shells –
 - 3.2 Domes, vaults and folded plates.
 - 3.3 Structural behavior of waffle slabs, ribbed and grid slabs.
 - 3.4 Introduction to prestressed concrete and its use.
 - 3.5 Structural behavior of large span roofs.
 - 3.6 Selection of type of structural components and material of construction

4. **Approximate Analysis and Design of Building Structures** (8 hours)
 - 4.1 Analysis and design for gravity loading
 - 4.2 Substitute frame method of analysis
 - 4.3 Portal and cantilever method of frame analysis
 - 4.4 Analysis and design of buildings for wind load
 - 4.5 Codal provisions for wind loading
 - 4.6 Calculation of wind pressure on walls and roofs of buildings
 - 4.7 Load cases and load combinations for design

5. Earthquake Resistant Design of Buildings (10 hours)

- 5.1 Principles of earthquake resistant design
- 5.2 Seismic coefficient method
- 5.3 Seismic weight
- 5.4 Seismic coefficient method
- 5.5 Introduction to response spectrum
- 5.6 Base shear calculation
- 5.7 Vertical distribution of base shear
- 5.8 Displacement and drift requirements
- 5.9 Torsion
- 5.10 Joint between adjacent buildings
- 5.11 Ductility and ductile detailing

References:

1. Dayaratnam, P., "Reinforced Concrete Structures", Oxford & IBH Publishing Co.
2. Jain, A.K., "Reinforced Concrete – Limit State Design", Nem Chand Bros.
3. BIS, IS 1893: 2002 (Part 1), "Criteria for Earthquake Resistant Design"
4. DUDBC, NBC-105:1994, "Seismic design of buildings"
5. BIS, IS 13920: 1993, "Ductile Detailing of Reinforced Concrete"

BUILDING SERVICES III

ME 760

Lecture : 2

Year : IV

Tutorial : 0

Part : II

Practical : 2

Course Objective:

To familiarize the students with basics of services requirements in building construction i.e.; HVAC Systems, Fire Protection System, Vertical Transportation and other mechanical equipment.

1. **Energy: Energy planning and auditing** (2 hours)
2. **HVAC Systems** (8 hours)
 - 2.1 Psychometric Chart, Thermal comfort, Ventilation standard
 - 2.2 HVAC design
 - 2.3 Components and Types of HVAC systems
 - 2.4 Installation of HVAC Systems
 - 2.5 Heating System (Solar/Boilers)
3. **Fire Protection Systems** (6 hours)
 - 3.1 Types of fire and safety codes
 - 3.2 Wet / dry pipe systems design
 - 3.3 Hydrant and sprinklers system design
4. **Vertical transportation systems and Construction equipment** (8 hours)
 - 4.1 Lifts and Escalators
 - 4.2 Transport Lifts and Construction Hoist
 - 4.3 Construction Equipment (Site preparation)
5. **Coordination of services with other discipline of construction** (6 hours)
 - 5.1 Air-conditioning system
 - 5.2 Fire protection System demonstration
 - 5.3 Solar PV and heating system
 - 5.4 Construction sites

Practical / Site Visit:**(30 hours)**

References:

1. Edward G. Pita , "Airconditioning Principles and System."
2. David V. Chadderton, "Building Services Engineering."
3. R.S.Khurmi & J.K.Gupta, "Refrigeration and Air-conditioning".

ELECTIVE I**AR 765****Lecture : 2****Tutorial : 0****Practical : 2****Year : IV****Part : II****Course Objective:**

To provide opportunities to pursue further studies in specific topic of student's interest and in new subjects not offered as core course.

Course Topics:

Course topics can be any relevant topics in architectural design, theory of architecture, architectural histories, contemporary design & trends, use of materials, construction & techniques etc. Pool of topics available for studies will be offered.

Evaluation Schemes:

Assessment	10
Final Exam	40
Practical	50
Total	100

ELECTIVE-I

LOW COST HOUSING

AR765 01

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : IV
 Part : II

Course Objectives:

- To sensitize student with the issue pertaining to low cost housing for the urban and rural low income group.
- To deal with the specific local materials in design and construction of low cost housing.
- To impart the knowledge of low cost construction technology from the perspective of efficient uses of building construction materials.

1. **Introduction** (2 hours)
 - 1.1 Introduction /Background &Defination.
 - 1.2 Present housing condition in Nepal
 - 1.3 Resource limitation
 - 1.4 Role of low cost housing
 - 1.5 Low cost housing in SAARC Countries and abroad.

2. **Land development** (2 hours)
 - 2.1 Land for housing
 - 2.2 Supply of land
 - 2.3 The role of land planning
 - 2.4 Supply of housing units through land development works
 - 2.4.1 GLD (Guided Land Development)
 - 2.4.2 Land Pooling
 - 2.4.3 Site and Services
 - 2.4.3.1 site selection
 - 2.4.3.2 site planning and services
 - 2.4.3.3 core housing scheme

3. **Infrastructures** (2 hours)
 - 3.1 Infrastructures & Types
 - 3.2 Role of infrastructure planning

4. **Low cost housing in urban areas** (12 hours)
 - 4.1 Design of an individual building (house)
 - 4.1.1 Building plan
 - 4.1.2 Staircase and circulation space
 - 4.1.3 Storey height
 - 4.1.4 Area of Openings
 - 4.1.5 Standardization

- 4.2 Building materials and construction technology
 - 4.2.1 Various types of building materials
 - 4.2.2 Building elements (Element of Building Structure)
 - 4.2.3 Vertical Elements
 - 4.2.3.1 Load bearing structure system & framed structure system
 - 4.2.3.2 Brick masonry
 - 4.2.3.3 Stone masonry
 - 4.2.3.4 Stone block masonry
 - 4.2.3.5 Hollow cement block masonry
 - 4.2.3.6 Timber Framed structure
 - 4.2.3.7 Metal Framed Structure
 - 4.2.3.8 RCC Framed Structure
 - 4.2.3.9 Comparison between conventional RCC pillar system and load bearing wall structure system (brick masonry & hollow cement block masonry)
 - 4.2.4 Horizontal Elements
 - 4.2.4.1 Floor Slab /Roof Slab
 - 4.2.4.2 Cast in situ RCC Slab
 - 4.2.4.3 Precast RCC slab
 - 4.2.4.4 Partial Precast RCC slab
 - 4.2.4.5 waffle slab
 - 4.2.4.6 Comparison between various types of horizontal elements.
 - 4.2.5 Other Elements
 - 4.2.5.1 Pennings
 - 4.2.5.2 Doors, windows & ventilators
 - 4.2.5.3 Size of doors, window & ventilator
 - 4.2.5.4 Materials for door, window & ventilator
 - 4.2.5.5 Timber door and window
 - 4.2.5.6 RCC frame for door and window
 - 4.2.5.7 Frameless door and window
 - 4.2.5.8 Ferro cement door and window
 - 4.2.5.9 Masonry projection door & window
 - 4.2.5.10 Comparison between various types of door & window
 - 4.2.5.11 Staircase –Cast in situ & Precast

5. Low cost housing in rural areas

(8 hours)

- 5.1 Introduction and Background
- 5.2 Problems in present housing condition & their solutions
- 5.3 Building materials and construction technology
- 5.4 Elements of building structure (Building Elements)
 - 5.4.1 Vertical elements
 - 5.4.1.1 Load bearing wall structure/Timber & Bamboo framed structure.
 - 5.4.1.2 Stone masonry

- 5.4.1.3 Brick masonry
- 5.4.1.4 Rammed mud wall
- 5.4.1.5 Wattle dub wall
- 5.4.1.6 Stud(timber/ bamboo)wall
- 5.4.1.7 Sun dried mud brick wall
- 5.4.1.8 Compacted soil block wall
- 5.4.1.9 Stabilized soil block wall
- 5.4.1.10Improvement in the compressed soil block
- 5.4.1.11Strengthening(retrofitting)the masonry wall
- 5.4.1.12Foundation for vertical post (timber /bamboo)
- 5.4.1.13Damp proof course in vertical elements
- 5.4.2 Horizontal elements
 - 5.4.2.1 Floor/Roof
 - 5.4.2.2 Solid floor for ground floor (treatment on ground floor)
 - 5.4.2.3 Roof and roofing techniques
 - 5.4.2.4 Use of thatch, clay tiles stone slab slate, cement tiles and Stabilized soil roof
- 5.4.3 Other Elements:
 - 5.4.3.1 Openings
 - 5.4.3.2 Door
 - 5.4.3.3 Windows
 - 5.4.3.4 Ventilators

6. Miscellaneous

(4hours)

- 6.1 Pavements on ground
 - 6.1.1 Brick pavement for pedestrian traffic
 - 6.1.2 Composite of brick & concrete pavement for pedestrian traffic
 - 6.1.3 Composite of brick & concrete pavement for vehicular traffic
 - 6.1.4 Cost comparison of 6.1.2. & 6.1.3
- 6.2 Pavements of telia bricks over roof /terrace
- 6.3 Advantages of telia brick and cement finish roof /terrace
- 6.4 Low cost latrines
 - 6.4.1 The latrine house (block)
 - 6.4.2 Volume of leaching pit
 - 6.4.3 Cost of low cost latrine

References

1. B L Shrestha , "Low Cost Housing for Practicing Engineers and Architects"
2. A.K. Lal, "Hand Book for Low Cost House "
3. G.C Mathur, "Low Cost Housing in Developing Countries"
4. Good Man R P. Pama & others , "Low Cost Housing Technology",

Evaluation Schedule for Practical Works

S.No	Time	Description	Marks	Remarks
	10 hrs.	Literature Study Case Study /Inventory of existing low cost housing (Urban/Rural)	10	Discussion & Site (Field Visit)
	4 hrs.	Conceptual Design (Urban /Rural) Site Planning & Building Design)	10	Presentation
	4 hrs.	Preliminary Deign Work	10	Desk Presentation
	12 hrs.	Final Design Work Report & Drawing Preparation	20	Submission/ Presentation /VIVA or Oral Examination
Total	30 hr		50	

DISASTER RISK MANAGEMENT IN TRADITIONAL SETTLEMENT

AR 765 03

Lecture : 2

Year : IV

Tutorial : 0

Part : II

Practical : 2

Course objective

- To familiarize the student with the fundamentals of disaster risk management and develop perspective in the area of risk management of cultural heritage
- To sensitize students with the issues pertaining to the conservation of cultural properties, and seeing it from the lens of risk management
- To support the Design Studio VIII by introducing structural and non-structural interventions in order to reduce the risks to historic properties.

1. Introduction (2hours)

- 1.1 Introduction to disaster in World
- 1.2 Scenario of disaster in Asia
- 1.3 Disaster in context of Nepal

2. Terminology and interrelation (4hours)

Hazard, Disaster, Risk, Vulnerability, Prevention, Mitigation, Response, Recovery

3. Disaster risk management (6 hours)

- 3.1 Before disaster
- 3.2 During disaster
- 3.3 After disaster

4. Characteristics of Traditional settlements in Nepal (2 hours)

5. Risk assessment, Vulnerability analysis, Risk Map for historic monuments and Cultural heritage (4 hours)

6. Historic monuments, cultural heritage and different natural as well as man-made risk (6 hours)

7. Government regulation and Institutional Framework for disaster management and protection of cultural heritage (2 hours)

8. Indigenous knowledge in disaster risk reduction (2 hours)
9. Community based risk management technique (2 hours)

Practical Assignment (30 hours)

S. No.	Time	Description	Marks
1	10 hrs.	Presentation on Case study of Disaster (National or International)	15
2	12hrs.	Presentation on Case study of traditional settlement and its disaster risk management in Nepal	20
3	8hrs.	Report on the study of cultural heritage and disaster risk management in Nepal	15
Total	30 hrs.		50

References:

1. Abarquez, I. & Murshed, Z, "Community Based Disaster Risk Reduction", Field Practitioners' Handbook, ADPC
2. Ben Wisner, Piers Blaikie, Terry Cannon and Ian Davis, " At Risk: Natural Hazards, People's Vulnerability and Disasters", Routledge
3. Dill, M., et al., "Natural Disaster Hotspots A Global Risk Analysis", The World Bank Publication
4. Gandhi, P. J., "Disaster Mitigation and Management: Post Tsunami Perspectives", Deep & Deep Publications (P) Ltd.
5. Gaur, R., " Disaster Management", Gnosis Publishers, Delhi, India
6. Jana, B.K., " Unprecedented Earthquake and Dreadful Tsunami", Mohit Publication
7. N. P. Bhandary, J. K. Subedi (Editors), "Disasters and Development: Investing in Sustainable Development of Nepal", Bajra Publications, Kathmandu, Nepal.
8. Pelling, Mark, "The Vulnerability of Cities : Natural Disasters and Social Resilience",
9. Rits-DMUCHa , "Disaster Risk Management of Cultural Heritage", International Training Course on Disaster Risk Management of Cultural Heritage 2009, Rits-DMUCH
10. Rits-DMUCH b, " Protecting World Cultural Heritage sites and their Historic Urban Environment from Earthquakes (Document)", Kathmandu Symposium, 16th to 19th February, 2009,

11. Smith, K., " Environmental Hazards Assessing Risk and Reducing Disaster", Routledge, London.
12. Stovel, H., " Risk Preparedness: A Management Manual for World Cultural Heritage", Rome: ICCROM
13. Thakral, K.K., "Disaster Management: Relevant Issues and Challenges", Cybertech Publications
14. Tiwari, S. R., " The Brick and The Bull", Himal Publication, Kathmandu, Nepal
15. Tiwari, S. R., " Temples of the Nepal Valley", ISBN 978 9937 8144 3 0 Himal Publication, Kathmandu, Nepal

PASSIVE SOLAR ARCHITECTURE

AR 765 04

Lecture : 2

Tutorial : 0

Practical : 2

Year : IV

Part : II

Course Objective:

- To introduce the concept of Passive Solar Architecture in relation to architectural design
- To deal with the use of the specific Passive Solar Architecture in design and construction to produce comfortable, energy efficient and environment friendly buildings.

- 1. Concept of Passive Solar Architecture** [4 hours]
 - 1.1 Introduction, Objectives & Importance
 - 1.2 History of passive solar architecture
 - 1.3 Concept of low energy passive building
- 2. Concept of Solar Radiation** [2 hours]
 - 2.1 Solar Energy & its type – Direct, Diffuse & Reflected
 - 2.2 Solar Radiation – Absorption & Reflection on Earth
 - 2.3 Geometry of Solar movement
 - 2.4 Solar Chart & its uses in passive design
- 3. Concept of Climatology** [2 hours]
 - 3.1 Climate, weather & season
 - 3.2 Micro & Macro, Micro Climatic factors
 - 3.3 Site & Urban climate
 - 3.4 Climatic data & interpretation
- 4. Passive Building Design Concept** [2 hours]
 - 4.1 Passive heating system
 - 4.2 Passive cooling system
 - 4.3 Passive ventilation system
- 5. Passive Solar Heating System** [5 hours]
 - 5.1 Passive Solar gain – site planning, orientation, colour, texture, material & technology
 - 5.2 Solar gain - Direct gain, Indirect gain & Isolated gain
 - 5.3 Direct solar gain – through window, glass wall
 - 5.4 Indirect solar gain – through thermal storage wall, floor & roof
 - 5.5 Thermal storage wall – Trombe wall, water wall, traditional brick wall
 - 5.6 Thermal storage roof – Solar chimney, Rooftrap, Roofpond

- 5.7 Thermal storage floor-traditional composite mud flooring
- 5.8 Isolated solar gain – Green house, Solarium, sunspace, etc

6. Passive Solar Cooling system [5 hours]

- 6.1 Control of Solar radiation – site planning, orientation, material & technology
- 6.2 Solar radiation control techniques - Natural & Artificial
- 6.3 Natural – using colour, texture, vegetation & water body
- 6.4 Artificial - shading by various External & Internal devices
- 6.5 External devices – vertical, horizontal, geometric overhang, chhajja etc
- 6.6 Internal devices – curtain, venetian blind, special glass etc.
- 6.7 Shading by texture – wall & roof
- 6.8 Roof shading – green roof, inverted pots, vegetation, water spray etc

7. Passive heating and cooling by ventilation system [2 hours]

- 7.1 Stack effect, Air vent
- 7.2 Courtyard effect
- 7.3 Wind tower & EAT system

8. Traditional passive buildings & settlement of Nepal [2 hours]

- 8.1 Traditional residential buildings of Kathmandu
- 8.2 Clusters & Courtyard type building & settlement
- 8.3 Traditional Earth shelters

9. Active Solar Heating & Cooling [2 hours]

- 9.1 Solar water heater, floor heating system
- 9.2 Hybrid system - Natural convective loop, water & air loop

10. Project work with the application of passive solar system [4 hours]

- 10.1 Design of a Residence in one of the climatic zones of Nepal-Terai, Hilly, Kathmandu valley & Mountain
- 10.2 Climatic data- Solar radiation, Temperature, wind pattern, Humidity, Precipitation
- 10.3 Micro-climatic data- local wind flow, Solar access to the site, vegetation, water body
- 10.4 Objective – Design response with comfort & energy efficiency
- 10.5 Site analysis- Topography, orientation, Solar envelope
- 10.6 Analysis of orientation, site & space planning & building configuration
- 10.7 Application of passive system for heating & cooling
- 10.8 Selection of materials & construction technology with low K value, U value
- 10.9 Construction of Openings, walls, roofs, floors etc.
- 10.10 Thermal performance of building envelope- wall, roof, opening
- 10.11 Analysis - Heat gain & loss by external, internal & ventilation load
- 10.12 Conclusion

Practical Assignment:

Evaluation Schedule for Practical Works

S.No	Duration	Stage	Marks
1	10 hrs	Case Studies / Assignments on: <ul style="list-style-type: none"> · Observation of different Passive building – Traditional & Modern · Observation of climate, microclimate, site, material, technology and Solar energy for Passive Solar system · Presentation 	15
2	15 hrs	Assignments on: <ul style="list-style-type: none"> · Design or renovation of a building with Passive Solar system · Presentation 	15
3	5 hrs	Report Submission /Attendance	20
Total	30 hrs		50

References:

1. N.K.Bansal&K.Rijal "Passive Solar Building in the Mountains" - ICIMOD
2. K.Rijal "Energy use in Mountain areas"- ICIMOD Nepal
3. V.Gupta , "Energy & Habitat" – Wiley Eastern Ltd, New Delhi, India
4. Er. B Pahari, "Passive Building-Concept & Design" KEC, Lalitpur, Nepal
5. S. Nienhuys, "Insulation for Houses in high altitudes" Renewable Energy Documents-2003, SNV Nepal
6. Koenigsberger, Ingersoll, "Manual of Tropical Housing and Building" - Orient Longman, Chennai, India,
7. S V Szokolay, A Krishan, "Climate Responsive Architecture" – Tata McGraw-Hill, New Delhi, India
8. S. Prakash, "Solar Architecture and Earth Construction in the Northwest Himalaya" – Har-Anand Publication, New Delhi, India
9. "Climatological Records of Nepal" –Department of Meteorology, Government of Nepal
10. www.passive solar architecture.com

ADVANCE COMPUTER AIDED ARCHITECTURAL GRAPHICS

AR 765 05

Lecture : 2
Tutorial : 0
Practical : 2

Year : IV
Part : II

Course objective

- To introduce the course in the study of Computer Aided Drafting (CAD) with regard to Architecture.
- Helps people to believe in the possibility of the design.
- To acquaint the student with the range of graphic tools which are available for conveying architectural notions.
- To prepare students for the professional life with tools that is used in AEC industry.

1. Basic Modeling

(6 hours)

A basic class in the study of three-dimensional (3-D) computer aided design for Architecture. The course will use modeling technology where sketch up will be used as the primary software to teach how to model, surface, light and animate the design of a building and its surrounding environmental context.

- 1.1 Modeling room for visualization
- 1.2 Composing scene and saving the camera view
- 1.3 Introduction to texture, materials and components for photo real rendering
- 1.4 Starting introduction to photo images and rendering
- 1.5 Walkthrough and flyover
- 1.6 Presentation in Layouts

2. Building Information Modeling (BIM)

(12 hours)

A basic class in the study of Building Information Modeling with Autodesk Revit Architecture as tool. The course will enable student to grasp the idea BIM learn modeling and information handling with Revit architecture

- 2.1 Introduction to Building Information Modeling (BIM)
- 2.2 Revit architecture Basics
 - 2.2.1 Lesson on User interface
 - 2.2.2 Lesson on Revit Elements and Families
 - 2.2.3 Lesson on Working with templates
- 2.3 Commencing a design: Lesson on Levels and grids
- 2.4 Building a Model
 - 2.4.1 lesson on creating a floor plan
 - 2.4.2 Lesson on adding walls
 - 2.4.3 Lessons on doors and windows
 - 2.4.4 Lesson on editing tools

- 2.5 Working with component families
- 2.6 Viewing the model
 - 2.6.1 Managing views and controlling the visibility
 - 2.6.2 Working with section and elevation vies
- 2.7 Working with dimensions its constraints
- 2.8 Developing building Model: Working on creating and modifying floors ceiling and roof
- 2.9 Presentation of the building model

3. Graphics (8 Hours)

Application of the techniques architectural illustrators uses to render architectural presentation drawings. This course focuses on the organization and preparation of a portfolio showcasing a student's creative work in preparation for employment in the field. Computer photo editing and printing, paper and digital portfolio preparation, and the implications of using a portfolio in the interview process for employment are emphasized. The course will use Adobe Photoshop / Autodesk Impression as the primary software.

- 3.1 Photoshop workspace basics: Introduction to tools, rulers, grids, guides, plug-ins and preferences
- 3.2 Color and tonal adjustments: understanding color adjustments with adjusting matching, replacing and mixing
- 3.3 Retouching and transformation
 - 3.3.1 Adjusting crop, rotation and retouching images
 - 3.3.2 Transforming objects
- 3.4 Working with layers and filters
- 3.5 Photographic special effects
 - 3.5.1 Blurring, sharpening, vigenetting
 - 3.5.2 using color for emphasis
 - 3.5.3 replacing skys
 - 3.5.4 Replication photographic filters
 - 3.5.5 layer masking for collage
 - 3.5.6 Adding depth of field
 - 3.5.7 Stitching paranomas together
 - 3.5.8 Sharpening techniques
- 3.6 Showing to the client

4. Presentations (4 hours)

Various graphic conventions and techniques will be presented and the rationale behind their use explained. Students will explore visual composition and organization, document assembly methods and various reproduction and image management techniques. Applications for impressive presentation. The course will use Adobe Indesign, skecthup layout as the primary software.

- 4.1 Adobe Indesign workspace basics for presentations
- 4.2 Sketchup layout basics for presentations

Practical Evaluation Scheme:

S.No.	Stages	Hours	Mark
1	Literature studies (report submission)	12	5
2	Conceptual design (presentation)	10	5
3	Final design (report and presentation)	8	40
	Total	30	50

References

1. Learning Autodesk revit Architecture 2010 volume 1 & 2
2. Sketcup 7.1 & 8.1 for architectural visualization
3. Using Adobe Photoshop CS4 @ CS5
4. The Photoshop book for digital photographers
5. Using Adobe indesign CS4 @ CS5

INTERIOR DESIGN

AR 765 06

Lecture : 2

Tutorial : 0

Practical : 2

Year : IV

Part : II

Course Objective:

- To provide the students the theoretical knowledge of interior design
- To make them acquainted with the current practice of interior design in different buildings
- To make them able to deal with various interior design & declination problems

- 1. Introduction (2 hours)**
 - 1.1 Interior spaces
 - 1.2 Interior design
 - 1.3 Interior Display
 - 1.4 Importance of architecture in Interiors
 - 1.5 The process of ID
 - 1.6 Design principles & elements
- 2. Special Population (4 hours)**
 - 2.1 Design for special population
 - 2.2 The ADA and Universal population
 - 2.3 Types of special population
- 3. Colour (2 hours)**
 - 3.1 Historical Evolution of colour
 - 3.2 The standard colour wheel theory and scheme
 - 3.3 Colour harmony and Properties of colours
 - 3.4 The colour trend market
- 4. Light (4 hours)**
 - 4.1 Liht in interiors
 - 4.2 Categories of Artificial Lighting
 - 4.3 Light controls and effect
 - 4.4 Metamerism
- 5. Space Planning And The Design Process (4 hours)**
 - 5.1 Plan arrangement
 - 5.2 Traffic patterns
 - 5.3 Floor plan symbols

6. **Furniture Layout/Details And Human Factors** (4 hours)
- 6.1 Furniture as symbol and History
 - 6.2 Furniture arrangement and layout
 - 6.3 Design principles in furnitures
 - 6.4 Human factors
7. **Architectural Details** (4 hours)
- 7.1 Architectural details in interiors
 - 7.2 Wall ceiling Doors and windows
 - 7.3 Treatment and finishes
 - 7.4 Other details
8. **Vastu In Interiors** (4 hours)
- 8.1 Introduction to Vaastu
 - 8.1.1 VastuPurusha (Vedic Vastu)
 - 8.1.2 Vastu Mandala
 - 8.1.3 Five Elements and Scientific Application
 - 8.2 Planning
 - 8.2.1 Orientation (Space)
 - 8.2.2 Layout (Furniture / Fixtures)
 - 8.2.3 Practical vastu tips for internal environments
 - 8.3 Energy and Materials
 - 8.3.1 Energy from colour and light
 - 8.3.2 Vastu remedies in interiors
9. **Environmental Considerations** (2 hours)
- 9.1 Environmental considerations of different material used
 - 9.2 The affecting factors in interiors

References:

1. Karla J. Nielson & David A. Taylor, "INTERIORS an Introduction", Brown & Benchmark, Publication,Iowa,ISBN,D-b97-12543-2, USA.
2. Chang, D.K, "Interior Design".
3. Professor B.B.Puri, "A Practical Guide to AGE LESS MIND", ISBN-81-90064-3-7, India.
4. Professor B.B.Puri, "Vastu Science for 21 st Century to Enjoy the Gift of Nature", ISBN 81-7822107-1, New Age Books Publication, India.
5. Halse, Albert O, "Architectural Rendering",
6. Madhura Karki, "Arts and Graphics", IOE, Nepal.
7. MadhuraKarki, "Graphics and Presentations", IOE,Nepal.
8. Doyle, Michael E, "Colour Drawing".
9. Gardens and Hannfer, "Lighting Design".
10. Lim and Rao, "Environmental Factors in the Design of Building"
11. Galvin P, J., "Kitchen Planning and Designing"

Practical Assignments

S.N.	Hours	Stages	Mark	Remarks
1	8	Literature Review and Case studies	10	Projects Residential/Non residential
2	16	Design (Concept) Development	15	Work in Theme
3	6	Final Project work (Report Preparation, Presentation)	25	Presentations and working Drawings Compilations of Reports and class works
Total	30		50	

URBAN DESIGN

AR 765 02

Lecture : 2
Tutorial : 0
Practical : 2

Year : IV
Part : II

Course Objectives:

- To introduce the basic concepts of urban design and to familiarize students with the fundamental principles of urban design.
- To enable students to inquire, analyze and understand a built environment, urban fabric and city morphology.
- To familiarize with the basic elements, varied applications, approaches and process of urban design.

1. Introduction: Comprehending Urban Design (2 hours)

- 1.1 Introduction, Evolution and History
- 1.2 The value and importance of Urban Design
- 1.3 Relation of Urban Design with Architecture and Urban Planning

2. Basic Principles of Urban Design (6 hours)

- 2.1 Essential urban design theories and principles:
 - 2.1.1 Density, diversity and mix
 - 2.1.2 Pedestrianizing and transit supportiveness
 - 2.1.3 Visual qualities: Character and identity, massing, composition (balance, proportion, rhythm, emphasis, unity)
 - 2.1.4 Spatial Qualities: Legibility, Permeability, Variety, Richness, Robustness, Safety
- 2.2 Responsiveness to context: sustainability, physical and social context
- 2.3 Historic and contemporary trends in urban design theory and practice.

3. Urban Design Elements (6 hours)

- 3.1 Urban Pattern and Urban Fabric
- 3.2 Building form, Streetscapes, Roofscapes
- 3.3 Connections: Visual and Physical
- 3.4 Movement structures and systems
- 3.5 Public Open Spaces: Streets, Squares, Spaces between buildings Parks, Landscape
- 3.6 Public Infrastructure and Amenities

4. Urban Morphology (4 hours)

- 4.1 Interpretation of settlement pattern: Figure and Ground, Linkage, Place
- 4.2 Urban Subdivisions: Grids, street-system, blocks, plots and building

typologies

- 4.3 Major urban typologies, their evolution and interrelationships, their interpretation and treatment in the contemporary city.

5. Sense of Place, Image of a City and Public Architecture (4 hours)

- 5.1 Theories and practices of "Place Making" and Sense of Place
 5.2 Public Realm, its qualities and roles
 5.3 Kelvin Lynch's prototypical Image of a City: path, edge, node, district, land marks
 5.4 Contemporary debates and design practices of public architecture.

6. The Urban Design Process (4 hours)

- 6.1 Contextual Analysis and mapping
 6.2 Rational conceptualizing within zoning, building regulations and Urban Design Guidelines
 6.3 Generation of alternatives and evaluation inclusive of community participation
 6.4 Design decision, implementation mechanism, follow up and evaluation

7. Case Studies: (4 hours)

- 7.1 Urban Design in the context of Nepal
 7.2 Successful examples of Urban Design in International context

Practical Assignment:

Evaluation Schedule for Practical Works

S.No	Time	Stage	Marks
1	10 hrs	Case Studies / Assignments on: • Different approaches of Urban Design • Successful Applications of the principles and tools of Urban Design • Presentation	15
2	15 hrs	Assignments on (Any One): • Design or revitalization of a built environment/historic/ cultural quarter with application of a suitable urban design approach • Application of Urban Design approach for place making, revitalizing an urban core or designing a public realm	15
3	5 hrs	Report Submission / Drawing Submissions/ Attendance	20
Total	30 hrs		50

References:

1. Bentley, et. Al, "Responsive Environments: A Manual for Designers", Architectural Press, Oxford.

2. Gehl, Jan, "Life between Buildings: Using Public Space", New York: Van Nostrand Reinhold.
3. Jacobs, Allan. B, "Great Streets" M.I.T Press, Cambridge, Massachusetts.
4. Jacobs, Jane, "The Death and Life of Great American Cities", New York, Modern Library.
5. Korn, Wolf Gang, "The Traditional Architecture of the Kathmandu Valley", Ratna Pustak Bhandar, Kathmandu.
6. Lynch, Kevin, "The Image of the City", M.I.T Press, Cambridge, Massachusetts.
7. Madanipour Ali. "Design of Urban Space: An Inquiry into a Socio-spatial Process", John Wiley and Sons, New York.
8. Watson, et all (ed.), "Time-Saver Standards for Urban Design", McGraw Hill.

SEMINAR & DIRECTED STUDIES

AR 801

Lecture : 0

Tutorial : 0

Practical : 4

Year : V

Part : I

Course Objective:

To provide opportunities to pursue further studies in specific topic of student's interest and in new subjects not offered as core course and learn to communicate in both oral and written form.

The focus will be on research and appropriate presentation skills & methods, critical analysis on the topic and defense of one's view point.

Course Topics:

Course topics can be any relevant topics in architectural design, theory of architecture, architectural histories, contemporary design & trends, use of materials, construction & techniques, urban planning etc.

A. Directed Studies:

- | | |
|--|------------|
| 1. Introduction | (2 hours) |
| 2. Exploration and finalization of topic of choice | (6 hours) |
| 3. Studies, research and discussions. | (30 hours) |
| 4. Final report | (6 hours) |

B. Seminar:

- | | |
|--|-----------|
| 1. Preparation of presentation A/V and reports | (4 hours) |
| 2. Seminar Presentation (2 presentations) | |
| 2.1 Seminar on any topic of choice related to architecture & planning. | (6 hours) |
| 2.2 Seminar on topic of directed studies. | (6 hours) |

Evaluation Scheme:

- | | |
|-------------------------------------|------------|
| 1. Final report on directed studies | (40 marks) |
| 2. Seminar presentations | (60 marks) |

DESIGN STUDIO VIII

AR 802

Lecture : 0
 Tutorial : 0
 Practical : 12

Year : V
 Part : I

Course Objective:

- Urban conservation and design
- Understanding built form and its visual and environmental impact to surrounding areas, tangible and intangible heritage.
- Application of knowledge acquired in Architectural conservation in previous semester.

Exercise No./Hours	Suggested Project	Content	Marks
180 Hours	Project incorporating Planning, Urban Design and Conservation issues in traditional urban context.	Master Plan with landscape, Plans, Sections, Elevations, 3D animation & detailed model	300

Evaluation Schedule for each Exercise:

Week/Hrs	Stage	Marks	Remarks
4 48 Hrs	Literature & Case Studies	40	Inclusive of presentation of case study
4 48 Hrs	Conceptual Design	80	
7 84 Hrs	Final Design	180	Inclusive of final presentation
Total		300	

References:

1. Time Savers Standard
2. Neufert Architectural Design Data
3. All relevant references

LANDSCAPE DESIGN & SITE PLANNING

AR 803

Lecture : 2

Tutorial : 0

Practical : 2

Year : V

Part : I

Course Objective:

To familiarize the subject of Landscape design and site planning and make student capable of applying the knowledge of the subject in their project works.

1. **Introduction to Landscape Architecture** (6 hours)
 - 1.1 Landscape Elements
 - 1.1.1 Hard Landscape Elements
 - 1.1.2 Soft Landscape elements
 - 1.2 Natural Landscape process
 - 1.2.1 Geological Process
 - 1.2.2 Biological Process
 - 1.2.3 Soil forming process
 - 1.3 Scope of works

2. **Design Resources & Techniques** (6 hours)
 - 2.1 Land and Land Form
 - 2.2 Water
 - 2.3 Vegetation
 - 2.4 Surface Materials, Outdoor fittings, Construction materials and structures

3. **Spatial Development & Site Planning** (6 hours)
 - 3.1 Site Analysis
 - 3.1.1 Site Factors
 - 3.1.2 Use Factors
 - 3.2 Concept
 - 3.2.1 General Philosophical concepts
 - 3.2.2 Specific functional concepts
 - 3.3 Design
 - 3.3.1 Form Development
 - Basic Elements of Design
 - Geometric form
 - Naturalistic form
 - 3.3.2 Principles of organization
 - Unity
 - Harmony
 - Interest
 - Simplicity

- Emphasis-dominance
- Balance
- Scale & proportion
- Sequence

4. Landscape in History (6 hours)

- 4.1 Tradition of landscape design in East
- 4.2 Tradition of landscape design in West

5. Miscellaneous (4 hours)

- 5.1 Roof Garden
- 5.2 Atriums
- 5.3 Roadside Plantations, Avenues
- 5.4 Indoor Landscape
- 5.5 Children's play area

6. Open Spaces and Parks (2 hours)

PRACTICAL STUDIO WORKS:

- 1. Landscape Graphics (4 hours)
- 2. Identifications of Plants (4 hours)
- 3. Residential / Institutional Sites (10 hours)
- 4. Landscape Design for neighborhood open spaces. (12 hours)

References:

- 1. Motloch, John. L., "Introduction to Landscape Design"
- 2. Reid, Grant W., "From Concept to Form in Landscape Design"
- 3. Walker, Theodore D. and Davis, David A., "Plan Graphics"
- 4. McHarg, Ian L., "Design with Nature"
- 5. Ching, Francis D.K., "Form, Space, and Order"
- 6. Acharya, Bal Krishna., "Aurbed JadiButi Rahasya"

PROFESSIONAL PRACTICE

AR 805

Lecture : 4**Tutorial : 0****Practical : 0****Year : V****Part : I****Course Objective:**

To familiarize students with the legal, economic and social issues related to professional practice. Focus will be on the role of the architect in a developing society and the emerging influence of economic liberalization. Emphasis will be on the ethical dimension governing professional conduct in serving the client/society.

The architect and his/her office, job organization, presentations, business management, sales promotion, human relations and personnel management, Design Audit procedures, Efficiency studies and performance appraisal, billing, accounting, business correspondence, information storage and retrieval are major focus areas.

- 1. Professional Ethics: (12 hours)**
 - 1.1 Definition of Ethics and the Professional
 - 1.2 Codes of Conduct – RIBA / AIA / IIA / SCAEF / SONA
 - 1.3 Practice Qualification
 - 1.4 Professional behavior and judgment
 - 1.5 Nepal Engineering council and proposed Council of Nepalese Architects
 - 1.6 Ethical Standard Interaction with other professional societies

- 2. Role of Architects: (8 hours)**
 - 2.1 Understanding who is professional and why architecture is considered a profession.
 - 2.2 Architect's role in the Society.
 - 2.3 Architect's role as a Team Leader.
 - 2.4 Relation with Client/Employer, Contractors and Fellow Professionals
 - 2.5 Responsibility of client/employer, contractor and consultants.

- 3. Office Management: (4 hours)**
 - 3.1 Understanding the procedures for the establishment of an Architectural Practice
 - 3.2 Company Act and Registration including with professional societies
 - 3.3 Architect's Administrative Role - financial, office accounts and billing.
 - 3.4 Management Project Co-ordination- Clients, Consultant and Project Managers
 - 3.5 Professional Development – Training

3.6 Office Automation Information Storage and Retrieval.

- 4. Hiring A/E Consultants: (8 hours)**
- 4.1 Introduction to various selection procedures including CBS, QCBS, and QBS. Long list and pre-qualification
 - 4.2 National Practices – Procurement Act and the Consultancy Development Act.
 - 4.2.1 Technical and Financial Proposals
 - 4.2.2 Guidelines of the Government
 - 4.3 International practices of multi and bi-lateral donors
 - 4.4 Design Competitions etc.
- 5. Contracts and Agreements: (8 hours)**
- 5.1 Understanding conditions of agreement- scope of work, comprehensive architectural services and conditions of engagement, remuneration and professional fees.
 - 5.2 The Terms of Reference and Scope of Works.
 - 5.3 Architectural Contract Agreements
 - 5.4 Professional Fees
 - 5.5 Professional Liabilities and Insurances /Securities
- 6. Business Promotion: (4 hours)**
- 6.1 Understanding the techniques of business: commissions, marketing experts
 - 6.2 Preparing proposals and winning contracts
 - 6.3 Marketing and negotiation
 - 6.4 Business planning, time and project management, risk mitigation, and mediation and arbitration as well as an understanding of trends that affect practice, such as globalization, outsourcing, project delivery, expanding practice settings, diversity, and others.
 - 6.5 Design audit & efficiency studies, analysis for special efficiency of buildings.
 - 6.6 Best practice and quality assurance
 - 6.7 Proprietary rights
- 7. Regulatory Controls: (10 hours)**
- 7.1 Regulations in planning and designing of projects in controlled areas
 - 7.2 Land use and Zoning
 - 7.3 Design standards and easements
 - 7.4 National Building Codes
 - 7.5 Housing & Apartment acts
 - 7.6 IEE/EIA studies
 - 7.7 Shelter policy
 - 7.8 Municipal Drawings
 - 7.9 Demolition

8. Valuation of Properties: (6 hours)

- 8.1 Introduction to property valuation/assessment
- 8.2 Property Assessment methods (Land, Building etc.)
- 8.3 Valuation assessment as per guidelines of the Nepal Rastra Bank

References:

1. AIA Manual of Professional Practice
2. IIA Standard for Establishing Fees
3. IIA Code of Ethics
4. Handbook for Users and Consultants ADB/Manila and other related documents related to procurement of services under ADB/Manila, World Bank/Washington and UN and other Bilateral Donor Agencies funded projects
5. GoN's Procurement Act and FAR (related to Consultant selection & procedures
6. Town Planning acts of Nepal 1962v with revisions
7. Building Standards (Nepal) with revisions
8. National Building Codes
9. National Building Code of India
10. Ancient Monument Preservation Act (Nepal) 2013 BS with revisions
11. Relevant ISI Standards
12. Company Act (Nepal) 2021 with revisions
13. Roshan Naravati, "Professional Practice", Lakhani Book Depot.

THESIS PROPOSAL AND RESEARCH

AR 806

Lecture : 1
 Tutorial : 2
 Practical : 0

Year : V
 Part : I

Course Objective:

To enable the student to prepare a proposal for design thesis and to plan, undertake and report on necessary research needed to undertake the design thesis proposed. This course is prerequisite to course AR 851 listed in Year V Part II. This course objective needs to be read in conjunction with the following requirements of Thesis -

A thesis in architecture is expected be a solution of a creative design problem (of a building complex, a building or elements of a building) that may have differing focus as seen from the perspective of different support courses such as environment, ecology, energy, climatology, design theory, planning, materials and technology of construction, services and the like. The thesis aims to demonstrate the students' ability and development to pursue analytical investigations related to the design of a building and/or its cultural, social, economic, material, climatic, technological, etc. dimensions. It should balance research and design application components. It should respond to contemporary issues in architecture and design.

The following component of works leading to the thesis has to be completed in this semester

1. Thesis topic, project justification and requirement assessment: The topic of thesis and its scope shall be finalized in consultation with the assigned thesis supervisor and the thesis supervision faculty. Requirement assessment shall include space, services, environment, ecology, energy and other design requirement of the proposed project. **(6 hours)**
2. Thesis proposal: The thesis proposal must be submitted in proper form for department records and must include introduction to the proposed thesis, the need and importance (justification), requirements, fundamental research themes and case studies, client and site information, expected output of research as well as the thesis. The submission will be marked. **(9 hours)**
3. Basic Research: This component of the course will require students to take up fundamental research and literature review (including architectural standards) on the functional and philosophical nature of the proposed thesis topic. Research on technological, environmental, ecological issues may be encouraged. The presentation shall be marked by a review team. **(15 hours)**
4. Case study: Students should take up cases of similar exemplary design projects

or components of project for detailed study. The cases may be analyzed from the perspective of form, function and technique. Studies may be made for all or some major determinants of design such as climate/sun/wind/rain, materials/their use and behavior, socio-cultural factors, functional reflections, etc. The presentation shall be marked by a review team. (15 hours)

Reference:

All references as identified for supporting courses.

Evaluation Scheme:

S. No.	Title	Hour	Total Marks
1.	Thesis Topic and Thesis Proposal – Submitted Hard and Soft copies.	15	50
2.	Fundamental Research and Findings. Presentations on Drawing Paper.	15	75
3.	Case Study Research and Findings. Presentations on Drawing Paper.	15	75

ELECTIVE II**AR 825****Lecture : 2****Tutorial : 0****Practical : 2****Year : V****Part : I****Course Objective:**

To provide opportunities to pursue further studies in specific topic of student's interest and in new subjects not offered as core course and learn to communicate in both oral and written form. Pool of subjects will be offered.

The focus will be on appropriate presentation skills & methods, critical analysis on the topic and defense of one's view point.

Course Topics:

Course topics can be any relevant topics in architectural design, theory of architecture, architectural

Evaluation Schemes:

Assessment	10
Final Exam	40
Practical	50
Total	100

ELECTIVE -II

HOUSING

AR 825 01

Lecture : 2

Year : V

Tutorial : 0

Part : I

Practical : 2

Course objective:

- To provide the students with the basic theoretical knowledge of housing .
- To make them acquainted with the current practice of housing in Nepal.
- To make them able to deal with housing schemes.

1. General and definition of housing (2hours)

- 1.1 General introduction
- 1.2 Definition

2. Theory of housing (4hours)

- 2.1 Structuralism
- 2.2 Functionalism
- 2.3 Formalism
- 2.4 Economy theory

3. Components of housing (4hours)

- 3.1 Physical components
- 3.2 Administrative and regulatory components
- 3.3 Management (construction)components
- 3.4 Financial /Capital components
- 3.5 Socio-economic components
- 3.6 Cultural components

4. Housing Standard (2hours)

- 4.1 Physical indicator
- 4.2 Social indicator
- 4.3 Space standard
- 4.4 Changes of housing stock of various standards

5. Socio -economic benefits of housing (4 hours)

- 5.1 Status
- 5.2 Infrastructure

- 5.3 Security and satisfaction
- 5.4 Economic Benefits

6. Shelter policy of Nepal (4hours)

- 6.1 Increasing the production of dwelling units and repair and maintenance of the existing stock.
- 6.2 Promote effective mobilization and allocation of financial resources.
- 6.3 Organizational improvement.

7. Approaches of Housing delivery (4hours)

- 7.1 Government approach
- 7.2 Popular/owner built housing approach
- 7.3 Privative sector developer housing approach
- 7.4 Cooperative approaches
- 7.5 Community housing approach

8. Parameters (2hours)

- 8.1 Physical parameters
- 8.2 Economics parameters
- 8.3 Social parameters
- 8.4 Institutional parameters

9. Apartment Act (4hours)

Practical Assignment

S.No	Time	Stage	Marks
1	6 hrs	Discussion & Consultation	10
2	16 hrs	Housing scheme preparation	10
3	4 hrs	Seminar/Viva	20
4	4 hrs	Report Preparation	10
Total	30		50

References:

1. Abrams, C., "Housing in the Modern World: Man's Struggle for Shelter in an Urbanizing World", MIT Press, Massachusetts
2. Hamdi, N., "Housing Without Houses: Participation, Flexibility, Enablement", London, Intermediate Technology Publications

3. Hasan, A., "Urban Housing Policies and Approaches in a Changing Asian Context", Karachi, City Press
4. Joshi, J., "Housing and Urban Development in Nepal: Analysis and Design of a Participatory Process", Kathmandu, Lajmina Joshi
5. Sharma, K., "Housing Finance in India", New Delhi, Centre for Urban Studies, Indian Institute for Public Administration
6. Turner, J.F.C, "Housing by the People", N. York, Pantheon Books

VERNACULAR ARCHITECTURE**AR 825 04****Lecture : 2****Tutorial : 0****Practical : 2****Year : V****Part : I****Course Objectives:**

- To familiarize the students with fundamental of Vernacular architecture.
- To understand the underlying concepts, ordering principles and explore the rapidly disappearing vernacular architectural entities.
- To impart the knowledge of conserving and preserving the vernacular architectural building.

1. Introduction**(1 hour)**

- 1.1 Introduction to vernacular architecture
 - 1.1.1 Society
 - 1.1.2 Culture
 - 1.1.3 Religion
 - 1.1.4 Architecture

2. Evolution of Architecture**(4 hours)**

- 2.1 Evolution and continuity
- 2.2 Approaches and concepts
 - 2.2.1 Aesthetic aspects and Architectural aspects.
 - 2.2.2 Anthropological aspects and ethnographical aspects.
 - 2.2.3 Developmental and conservationist aspects.
 - 2.2.4 Historical and Folkloristic Aspects.

3. Various Influencing factors**(6 hours)**

- 3.1 Physical factors and their influence on local architecture.
- 3.2 Climate and ecological environment.
 - 3.2.1 Tropical, sub-tropical, monsoon, desert, maritime, montane, continental, arctic and sub-arctic and Mediterranean.
- 3.3 Geography
 - 3.3.1 Location and sites (below ground, coastal, slope, valley, plain or flat grass land etc.)
 - 3.3.2 Topography (Plain, slope & terrain etc.)
- 3.4 Population and settlement pattern
 - 3.4.1 Growth
 - 3.4.2 Distribution and density (Sparse or Scattered & Dense)
 - 3.4.3 Migration and urbanization.
 - 3.4.4 Availability of building materials (Materials and building resource).
 - 3.4.5 Use of rocks and stones

- 3.4.6 Use of earth and clays
- 3.4.7 Use of trees, grasses, palms, timber and thatch
- 3.4.8 Use of animal products
- 3.4.9 Use of manufactured products.
- 3.5 Other miscellaneous materials and building recourses: Fibers, Cement, Glass, Tires Sheet, Metal etc.

4. Social and Cultural attributes (2 hours)

- 4.1 Social Organization, Cultural attributes and architecture
- 4.2 Daily Practices.
- 4.3 Family Occupation and economy
- 4.4 Behavior Patterns of occupations.
- 4.5 Social structures
 - 4.5.1 Individual & interdependence
 - 4.5.2 Various economic social stratifications & organization
 - 4.5.3 Leaders and authority

5. Symbolism in Architecture (6 hours)

- 5.1 Symbolism and Architectural Manifestation
- 5.2 **Decorated elements:** Doorways, Facades, Columns, Walls, Floors, Openings and Other elements.
- 5.3 **Inscriptions:** Carpenters' assembly marks, Date stones, Eng raved text, Masons marks, Sign writing, tile impression and other elements.
- 5.4 **Motifs:** Swastika, Square (Mandala), Spiral geometry, Solar(sun), Star, Lunar, Cross, Crest, Suva lava , etc
- 5.5 **Rules, Systems and Rituals:** Vastu Vidya, FengShui, Divination & Sacrifice (Lela) (Bali), Vastu Purusha Mandala etc.
- 5.6 Proportion, symmetry, Golden Selection etc
- 5.7 **Symbolic Spaces etc:** Cosmic, Fertility, Mythic domain, sacred boundary, etc.

6. Building Technology and Production (2 hours)

- 6.1 Building processes technology and architecture productions.
- 6.2 Designing to Dimensions, traditional crafts skills and building problems and solutions.
- 6.3 Framing and infilling
 - 6.3.1 Structure and supports.
 - 6.3.2 Walls, Screen & fenesters etc.
 - 6.3.3 Flooring, roofing etc.
- 6.4 Services
 - 6.4.1 Circulations (Verandah, Balcony, Corridor, Hall, Gallery, Porch, Chowk, Lobby, Stair, Ladder, Lisno, Steps, Ramp, Footways, Bridge, etc)
 - 6.4.2 Cooking and Heating (Chulo, Bake, Oven, Againo, etc)
 - 6.4.3 Sanitation & Hygiene (Latrine ,Bath, Bathing Ghat, sauna, Stone, Spout & Pond etc.

6.4.4 Ventilation cooling and Lighting (courtyard, louvers, Water cooling, Aankhijhyal, ventilation shaft, wind tower, Water channel etc.

6.4.5 Water supply (Dhungedhaaro, Opi, Padhero, Canal Chanel, cistern jharu, irrigation.etc)

7. Architectural Types (6 hours)

7.1 Uses and functions of vernacular architecture (4 hrs)

7.2 Domestic architecture
Residential building, Hut Villa and Bungalow, etc.

7.3 Sanctuaries and Temples
Hindu temple, Buddhist Stupa, Church, Chapel, Cult House, Madrasa, Monastery, Mosque, Synagouge, Temple (haveli),Chorten, etc.

7.4 Shrine & Funerary
Cemetery, Grave shed , Grave Shelter, House deity (VastuPurusha), Memorial, Tomb, Yard Shine, House Shrine, etc.

7.5 Authority & status
Citadel, Dzong, Guest House, Palace etc.

7.6 Economic and social
7.6.1 Economic: Bazaar, Shop, Counter, Store, Grain elevator, Granary (rice) Pottery kiln etc.

7.6.2 Social: Drum tower (Menstruation/birth/Chaaupadi) Bride House, Dacha, Meeting hall, Dharma Sanstha, Tea house, Theater building etc.

7.7 Out building (House) , Barn Cowshed (Goth), Corn culling, Granary, Pigeon Tower Storage Silo Thrashing, House, Watch Tower etc.

8. Roles of Architecture in Community (3 hours)

8.1 Survival and continuity of vernacular architecture

8.2 Collaboration of mordan techniques and vernacular techniques

8.3 Roles of architects and mordan techniques

8.4 Role of community

References:

1. Paul Oliver, "Encyclopedia of Vernacular Architecture Vol 1&2"
2. Wolfgang korn, " The Traditional Architecture of Kathmandu Valley"
3. Prof. Dr.S.R.Tiwari, "The Brick & Bull"
4. Joel M.BochInsacson, "Temples of Nepal"
5. Dr. C. B. Joshi, "Nepal Ka Kalatmak Jhyalharu"

Practical Assignments:

1. Inventory of existing vernacular architecture (10hours)
 - Domestic architecture (dwellings)
 - Religious & culture building
 - Scancharies& temples
 - Shrine & funerary architecture

- Economic social & out building
- 2. Project work (design work) (15hours)
 - Conservation & regeneration
 - Renewable and retrofitting
 - Design of new vernacular architects on selected topics
- 3. Site visit/discussion (5hours)
 - Report preparation & presentation

GREEN BUILDING DESIGN

AR 825 02

Lecture : 2

Year : V

Tutorial : 0

Part : I

Practical : 2

Course Objective:

- To introduce the basic concepts of Green building in relation to architectural design
- To deal with the use of the Green concept in design and construction to produce healthy, economical, comfortable, energy efficient and environment friendly green buildings.

1. Concept of Green Building (4 hours)

- 1.1 Introduction and Objectives
- 1.2 History of Green Building
- 1.3 Importance of Green Building
- 1.4 Concept of Green Building

2. Green Building Rating System (2 hours)

- 2.1 Building Rating System
- 2.2 LEED, BREEAM, CASBEE, GRIHA etc.

3. Green Building Design (4 hours)

- 3.1 Site efficiency
- 3.2 Green material and resources
- 3.3 Green technology
- 3.4 Energy efficiency
- 3.5 Water efficiency
- 3.6 Indoor air quality
- 3.7 Waste management
- 3.8 Innovative design

4. Site Efficiency (2 hours)

- 4.1 Site – Orientation, landscape, open space
- 4.2 Site – Transportation, community service

5. Green Building Material and Resources (3 hours)

- 5.1 Embodied energy of material
- 5.2 Reuse & recycle material
- 5.3 Healthy environment friendly material – CSEB, Green concrete, VSBK brick etc.

6. Green Building Technology (3 hours)

- 6.1 Traditional technique – wall, floor, roof, Rammed earth

- 6.2 Modern Green technique - Rat-trap bond, cavity structure, Inco- panel, UPVC door, windows, CSEB roof etc.
- 7. Energy Efficiency (5 hours)**
- 7.1 Energy efficient Lighting – Day lighting, artificial lighting
- 7.2 Day lighting – Atrium, Sky light
- 7.3 Artificial lighting – CFL, LED lighting,
- 7.4 Passive Solar Design
Passive solar heating, Passive solar cooling, Passive solar heating & cooling
- 7.5 Passive solar heating - Direct, Indirect, Isolated gain, color, texture
- 7.6 Passive solar cooling – Shading, ventilation, color, texture Courtyard effect, Air cooling, Earth cooling, EAT, Evaporation cooling
- 7.7 Combined Passive heating and cooling
- 7.8 Trombe wall, Roof ponds, Solar chimney, Wind tower, etc.
- 7.9 Active system- Solar PV panel, Solar water heater
- 8. Water Efficiency, Solid Waste Management & Indoor Air Quality (1 hour)**
- 8.1 Water-efficient toilet, Sensor taps
- 8.2 Rainwater harvesting, Waste water treatment
- 8.3 Biomass - Biogas, bio-digester
- 9. Case Study of Green Buildings in Nepal (2 hours)**
- 9.1 Zero Energy Building (CES)
- 9.2 Green School Buildings
- 9.3 LEED rated Buildings
- 10. Project Work with the Application Green Building Design (4 hours)**
- 10.1 Design of a Green building in Nepal
- 10.2 Climatic data- Solar radiation, Temperature, Wind pattern, Humidity, Precipitation
- 10.3 10.3 Micro-climatic data- local wind flow, Solar access to the site, vegetation, water body
- 10.4 Objective – Design response with green, energy efficiency & environment friendly
- 10.5 Site selection - with transportation, community service, environment friendly
- 10.6 Application of energy-efficient design
- 10.7 Selection of Green materials & construction technology
- 10.8 Integration of Renewable Energy systems
- 10.9 Lighting & HVAC system
- 10.10 Water efficiency & Solid waste management
- 10.11 Conclusion

References:

1. Er. B Pahari, 2002 "Passive Building-Concept & Design" KEC, Lalitpur, Nepal
2. N. K. Bansal & K. Rijal "Passive Solar Building in the Mountains" – ICIMOD, Nepal

3. K. Rijal "Energy use in Mountain areas"- ICIMOD, Nepal.
4. M Majumdar, 2002 "Energy- efficient buildings in India"- teri, New Delhi, India
5. "Sustainable Building Design Manual"- 2004 ERI, New Delhi, India
6. V. Gupta 1984 "Energy & Habitat" – Wiley Eastern Ltd, New Delhi, India
7. S. Nienhuys, 2003, "Insulation for Houses in high altitudes" Renewable Energy Documents-2003, SNV Nepal
8. Koenigsberger, Ingersoll, 1975 "Manual of Tropical Housing and Building" – Orient Longman, Chennai, India,
9. S V Szokolay, A Krishan, 2001 "Climate Responsive Architecture" – Tata McGraw- Hill, New Delhi, India
10. S. Prakash, 1991" Solar architecture and Earth construction in the Northwest Himalaya" – Har-Anand Publication, New Delhi, India
11. "Climatological Records of Nepal" -Department of Meteorology, Government of Nepal
12. www.Green building.com

Practical Assignment:

Evaluation Schedule for Practical Works

S.No	Time	Stage	Marks
1	10 hrs	Case Studies / Assignments on: <ul style="list-style-type: none"> • Different GREEN buildings • Observation of different GREEN building rating system LEED, GRIHA, CASBEE, etc. • Observation of climate, site, material, technology and energy for GREEN building • Presentation 	15
2	15 hrs	Assignments on: <ul style="list-style-type: none"> • Design or renovation of a building with GREEN concept • Presentation 	15
3	5 hrs	Report Submission / Attendance	20
Total	30 hrs		50

GEOGRAPHIC INFORMATION SYSTEM

AR 825 03

Lecture : 2
 Tutorial : 0
 Practical : 2

Year : V
 Part : I

Course Objective:

On Completion, a student will be able to

- Understand the principle and the use of GIS vocabulary
- Carryout basic GIS Operation
- Use the knowledge of GIS for settlement study & planning/ urban diversity and infrastructure planning & inventory assessments
- Understand fundamentals of Remote Sensing, Global Positioning System (GPS)

1. Overview of GIS (6 hours)

- 1.1 Introduction and background of GIS
- 1.2 GIS sub-systems
 - 1.2.1 Data input
 - 1.2.2 Data Storage and retrieval
 - 1.2.3 Data manipulation and analysis
 - 1.2.4 Data output
- 1.3 Components of GIS – Hardware, software, Data, People, Methods
- 1.4 GIS Applications
 - 1.4.1 Different application fields
 - 1.4.2 Key features of GIS
- 1.5 Perspectives on GIS and Sustainability Management
- 1.6 Introduction to Remote Sensing

2. Map Projection Systems (2 hours)

- 2.1 Map scale
- 2.2 Map projections and its classification
 - 2.2.1 According to geometric surface - azimuthal, cylindrical & conical
 - 2.2.2 According to the property - equivalent, equidistant & conformal
- 2.3 Spatial coordinate system
 - 2.3.1 Geographic coordinate system
 - 2.3.2 Plane coordinate system
- 2.4 Global Positioning System

3. Data Source and Data Model (4 hours)

- 3.1 Data types
 - 3.1.1 Spatial data
 - 3.1.2 Vector data - Point, Line and Polygon

- 3.1.3 Raster data – eg. DEM
- 3.2 Comparison between vector and raster data types
- 3.3 Other data types
 - 3.3.1 Image data
 - 3.3.2 Triangular Irregular Network (TIN)
- 3.4 Data sources and geo-referencing of spatial data

- 4. Data Analysis (6 hours)**
 - 4.1 Introduction to Data analysis
 - 4.2 Analysis types
 - 4.2.1 Database Query.
 - 4.2.2 Spatial Query
 - 4.2.3 Overlay Operations
 - 4.2.4 Network analysis.
 - 4.2.5 Buffer Operations

- 5. Data Presentation (4 hours)**
 - 5.1 Common Map Elements
 - 5.2 Map Classification
 - 5.2.1 Cadastral Maps
 - 5.2.2 Topographic Maps
 - 5.2.3 Thematic Maps
 - 5.3 Bertin's visual variables
 - 5.4 Data type classification
 - 5.4.1 Qualitative data – Nominal
 - 5.4.2 Quantitative data – Ordinal, Interval, Ratio
 - 5.5 Map visualization & map presentation techniques
 - 5.5.1 Qualitative data
 - 5.5.2 Quantitative data – Absolute and Relative

- 6. GIS Application for Architects and Planners (8 hours)**
 - 6.1 Urban Land use Planning
 - 6.1.1 Objectives of Landuse Planning – Activities, Location, Implementation
 - 6.1.2 Effective use of GIS for land use planning
 - 6.2 Urban Infrastructure Management
 - 6.2.1 Infrastructure types
 - 6.2.2 Principles of GIS in Infrastructure management
 - 6.3 Urban Transport
 - 6.3.1 Definition of Urban transport
 - 6.3.2 Aggregate and disaggregate models
 - 6.3.3 Application of GIS in transport planning
 - 6.4 Disaster Management
 - 6.4.1 Urban disaster management
 - 6.4.2 Key definitions – Hazard, Risk, Vulnerability,
 - 6.4.3 GIS application in disaster management

Practical:

S.No	Duration	Stage	Marks
1	10 hrs	Preliminary exercises: <ul style="list-style-type: none"> · Usage of GIS software package – Arc-Catalog & ArcMap. · Various Exercises for understanding GIS Concepts 	10
2	20hrs	Case Studies / Assignments on: <ul style="list-style-type: none"> · Problem Identification · Data collection · Data analysis · Cartography & map presentation · Presentation on findings Possible Topics: Settlement Planning, Infrastructure, Transport, Disaster related etc.	40
3		Report Submission	
Total	30		50

References:

1. Albrecht, J., "Key Concepts & Techniques in GIS", SAGE Publication.
2. Masser, I., Hofstee, P., Brussel, M, "GIS for Urban Planning in the Developing World", ITC Publication.
3. Nyerges, T.I., Jankowski, P., "Regional and Urban GIS, A Decision Support Approach", ISBN 978-1-60623-336-8, THE GUILFORD PRESS, New York.
4. Sutton, T., Dassau, O., Sutton, M., "A Gentle Introduction to GIS", Spatial Planning & Information, Department of Land Affairs, Eastern Cape.

ENERGY EFFICIENT BUILDING DESIGN

AR 825 05

Lecture : 2

Tutorial : 0

Practical : 2

Year : V

Part : I

Course Objective:

- To introduce the basic concepts of energy efficient building design in relation to architectural design
- To deal with the use of the energy efficient building design in design and construction to produce comfortable, energy efficient and environment friendly green buildings.
- To be able to incorporate energy efficiency criteria in building design in different climatic zones
- To use the concept of energy efficient design for the final thesis project

1. Concept of Energy Efficient Building (4 hours)

- 1.1 Introduction and Objectives
- 1.2 Importance of Energy Efficiency
- 1.3 Concept of Energy Efficient Building
- 1.4 Concept of Green & LEED Building

2. Energy Situation & Consumption (2 hours)

- 2.1 Energy crisis
- 2.2 Energy situation in Nepal & World
- 2.3 Energy resource in Nepal – Solar, biomass, hydro, etc
- 2.4 Energy consumption pattern - Household, Commercial, Industrial etc

3. Energy Efficient Building Design (3 hours)

- 3.1 Study of climate & climatic data
- 3.2 Site planning
- 3.3 Passive solar design
- 3.4 Building material
- 3.5 Building technology
- 3.6 Integration of Renewable Energy systems
- 3.7 Energy system – Lighting, HVAC
- 3.8 Water Efficiency & Solid Waste Management

4. Study of Climate & Climatic Data (2 hours)

- 4.1 Climate, micro-climate, climatic zone
- 4.2 Solar radiation, Temperature, Humidity, Wind, Precipitation

5. **Site Planning** (1 hour)
 - 5.1 Site Analysis - Topography, Solar access, Wind flow, Site Orientation, Vegetation,
6. **Passive Solar Design** (3 hours)
 - 6.1 Passive solar heating, Passive solar cooling, Passive solar heating & cooling
 - 6.2 Passive solar heating - Direct, Indirect, Isolated gain, color, texture
 - 6.3 Passive solar cooling – Shading, ventilation, color, texture
Shading by Neighboring buildings, Vegetation, Overhangs, louvers, texture facade, movable blinds and curtains
Courtyard effect, Air cooling, Earth cooling, EAT, Evaporation cooling
 - 6.4 Combined Passive heating and cooling – Trombe wall, Roof ponds, Solar chimney, Wind tower, etc.
7. **Building Material** (1 hour)
 - 7.1 Embodied energy of material
 - 7.2 Reuse & recycle material
 - 7.3 Healthy environment friendly material
8. **Building Technology** (2 hours)
 - 8.1 Traditional efficient technique – wall, floor, roof, Rammed earth
 - 8.2 Modern efficient technique - CSEB, Rat-trap bond, cavity structure,
 - 8.3 Inco- panel, UPVC door, windows, green concrete, etc.
9. **Energy System** (3 hours)
 - 9.1 Energy efficient Lighting – Day lighting, Artificial lighting
 - 9.2 Day lighting – Atrium, Sky light,
 - 9.3 Artificial lighting – CFL, LED lighting,
 - 9.4 HVAC, EAT system
10. **Integration of Renewable Energy Systems** (2 hours)
 - 10.1 Solar PV panel
 - 10.2 Solar water heater
 - 10.3 Solar space heating system
 - 10.4 Bio-mass and others
11. **Water Efficiency & Solid Waste Management** (1 hour)
 - 11.1 Water-efficient toilet, Sensor taps
 - 11.2 Rainwater harvesting, Waste water treatment
 - 11.3 Biogas/bio-digester
12. **Case study of Energy Efficient Buildings - Zero Energy Building & other Buildings** (3 hours)

13. Project Work with the Application of Energy Efficient Building Design (3 hours)

- 13.1 Design of a building in one of the climatic zones of Nepal
- 13.2 Climatic data- Solar radiation, Temperature, Wind pattern, Humidity, Precipitation
- 13.3 Micro-climatic data- local wind flow, Solar access to the site, vegetation, water body
- 13.4 Objective – Design response with energy efficiency & environment friendly
- 13.5 Site analysis- site efficiency with topography, orientation, Solar envelope
- 13.6 Application of energy-efficient design
- 13.7 Selection of materials & construction technology
- 13.8 Integration of Renewable Energy systems

- 13.9 Lighting & HVAC system
- 13.10 Water efficiency & Solid waste management
- 13.11 Conclusion

Practical Assignment:

Evaluation Schedule for Practical Works

S.No	Duration	Stage	Marks
1	10 hours	Case Studies / Assignments on: <ul style="list-style-type: none"> • Different energy-efficient buildings • Observation of different energy efficient building rating system LEED, GRIHA, etc. • Observation of climate, site, material, technology and energy for energy-efficient system • Presentation 	15
2	15 hours	Assignments on: <ul style="list-style-type: none"> • Design or renovation of a building with energy-efficiency • Presentation 	15
3	5 hours	Report Submission / Attendance	20
Total	30 hours		50

References:

1. Er. B Pahari, "Passive Building-Concept & Design", KEC, Lalitpur, Nepal
2. N.K.Bansal & K.Rijal "Passive Solar Building in the Mountains" – ICIMOD, Nepal
3. K.Rijal "Energy use in Mountain areas"- ICIMOD, Nepal
4. M Majumdar, "Energy- efficient buildings in India"- teri, New Delhi, India
5. "Sustainable Building Design Manual"- 2004 ERI, New Delhi, India
6. V.Gupta, "Energy & Habitat" – Wiley Eastern Ltd, New Delhi, India

7. S. Nienhuys, "Insulation for Houses in high altitudes" Renewable Energy Documents-2003, SNV Nepal
8. Koenigsberger, Ingersoll, "Manual of Tropical Housing and Building" – Orient Longman, Chennai, India,
9. S V Szokolay, A krishan, "Climate Responsive Architecture" – Tata McGraw-Hill, New Delhi, India
10. S. Prakash, 1991" Solar architecture and Earth construction in the Northwest Himalaya" – Har-Anand Publication, New Delhi, India
11. "Climatological Records of Nepal" –Department of Meteorology, Government of Nepal
12. www.energy-efficientbuilding.com

ENVIRONMENTAL IMPACT ASSESSMENT

AR 825 06

Lecture : 2**Tutorial : 0****Practical : 2****Year : V****Part : I****Course Objective**

The objective of the course is to acquaint the students with basic concept of environmental impact assessment (E.I.A.) after completion of this course the student will be able to use the E.I.A. process and guidelines which have been currently enforced by Govt. of any developmental project with planning, Housing, and other institutional building complex of significant scale in general E.I.A. is used for any significant infrastructure Developmental project.

1. **Introduction** (5 hours)
Definition of E.I.A. benefits introduction to National E.I.A. Guidelines, Environmental system, Types of impacts, E.I.A. principles and E.I.A. project cycle (4 Hours)
2. **National E.I.A process Methodology** (6 hours)
Screening initial impact identification, initial Environmental examination I.E.E., scoping, assessment of impact and impact aggregation, mitigation measure, E.I.A. Report (6 Hours)
3. **Prediction Evaluation Technique and Tools** (6 hours)
Physical, chemical, Biological and socio-economic impacts, Analysis, prediction and Evaluation of impacts. (6 Hours)
4. **Management of E.I.A. Process** (6 hours)
Public participation, E.I.A. Review, Monitoring and Environmental Auditing. (6 Hours)
5. **Planning and E.I.A.** (4 hours)
Integrating E.I.A. in Developmental planning process and in sustainable Development concept of planning and sustainable Development interrelationship of Environment, sustainable Development and projects related with infrastructural Development. (5 Hours)
6. **Case Studies** (3 hours)
Case studies of some national projects which went through E.I.A. process. (3 Hours)

References:

1. Larry W Canter, "Environment impact Assessment", Mc Graw Hill.
2. National Environmental Protection Guidelines Nepal 1993.

3. National Conservation Strategy for Nepal 1988.
4. B.K. Uprety, "Environmental impact Assessment"
5. R.B. Khadka, "Environmental impact Assessment"
6. E.I.A. manual (IUCN Nepal) .
7. W.A. Ross, "Evaluating Environmental impact Assessment"
8. Brundtland Report, "Our common Future 1987 (WCED)".
9. I.U.P. , "Caring for Earth".

THESIS DESIGN

AR 851

Tutorial : 7 (Contact hours)
Practical : 23 (Studio working hours)

Year : V
Part : II

Course Objective:

A thesis in architecture is expected to be a solution of a creative design problem (of a building complex, a building or elements of a building) that may have differing focus as seen from the perspective of different support courses such as environment, ecology, energy, design theory, climatology, planning, materials and technology of construction, services and the like. The thesis aims to demonstrate the students' ability and development to pursue analytical investigations related to the design of a building and/or its cultural, social, economic, material, climatic, technological, etc. dimensions. It should balance research and design application components. It should respond to contemporary issues in architecture and design.

The thesis design will be as per the proposal approved in the earlier semester and will be approached on the basis of research outcomes thereof. The students will undertake any additional research and study as needed. It will lead to the following final output:

- (i) Design/Drawing component: Drawings to fully explain conceptualization, development and design of the approved project. The output will be in form of presentation drawings. The drawings shall at least pertain to site and layouts, plans as required, four elevations and at least two sections, two perspectives, 3D drawings and model as necessary to fully explain the concept and design. Students shall seek prior approval for use of different sizes of drawings.
- (ii) Explanatory Component: The thesis shall also contain a written explanatory section describing the concept/ design and this section will be illustrated with A4 size schematic drawings of the proposal. Thesis report shall include the proposal, fundamental research process and findings, case study analysis and findings as separate chapters. [Size A4 for written, illustrative and explanatory components: Black on white. Sketches and limited number of BW Photographs]
- (iii) Submission for Department records and study completion: Final of Thesis Report with an appendix of photographic reproductions of all drawings and Models.

Multimedia presentations supplements may be allowed with permission but this shall not replace the drawings and models.

The studio works will be reviewed in following stages of design exercise:

1. Conceptual Design (28 hours)

The first stage of submissions and presentations will be expressions of ideas and concepts in design and planning for the approved thesis project based

on guidelines and conclusions (points of departures and cautions) from the research and case studies done in the previous semester or additional studies done afterwards to meet the demands of comments made during the case study presentations (ii) make analysis of site for design purpose (iii) think-up some basic ideas and (iv) apply these together to formulate planning and design concepts and (v) draw and present the concepts in the form of basic/explanatory sketches/drawing. Concepts will be produced as 'presentation drawings and sketches'.

2. Preliminary Design (28 hours)

At this stage the concepts will be detailed into designs and a presentation of major aspects of the design shall be made in the preliminary form with, say, single line drawings in orthographic plans/elevations/sections or perspectives and/or with simple models in paper, wood etc. – they should explain the translation of the idea/concept into the design. Review team shall include at least one internal faculty.

3. Design Development (28 hours)

Further development of designs shall be made along with sufficient consideration of form, style, energy, services, structure, construction, safety and security, etc. and output presented in form of presentation drawings. The drawings shall at least pertain to site and layouts, plans as required, four elevations and at least two sections, two perspectives or model and as necessary to fully explain the concept and design. Review team shall include at least one faculty from other colleges.

4. THESIS FINAL SUBMISSION (21 hours)

For Jury Review including a Draft Thesis report

Assessments Marks Distribution:

S.No.	Title	Hour	Marks
1.	Conceptual Design. Review of presentations on Drawing Paper	28 hours	100
2.	Preliminary Design. Review of presentations on Drawing Paper.	28 hours	100
3.	Design Development. Review of presentations on Drawing Paper.	28 hours	100

Examination Marks:

S.No.	Title	Hour	Total Marks
	Jury Examination	-	350

Reference:

All references as identified for supporting courses.