BUILDING CONSTRUCTION II
AR 504

Lecture : 2 **Year : II**
Tutorial : 0 **Part : I**
Practical : 2

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.

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",

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1	6	8
2 &3	8	8
4	4	8
5	4	8
6 & 7	8	8
Total	**30**	**40**

*There may be minor deviation in marks distribution.

Practical Assignments:

Units	Hours	No. of Sheets	Marks Distribution
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**

BUILDING MATERIALS II
AR 503

Lecture: 3 **Year : II**
Tutorial: 1 **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. 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
    1. Cement Paint
    2. Distempers
    3. Emulsion
    4. Enamel Paint
    5. Damp – Proof Paint
    6. Water Proof Paint
    7. Weather Coat Paint
    8. Texture paint
    9. Creative Paint
    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",

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1	9	16
2	9	16
3	9	16
4,5,6	9	16
7,8	9	16
Total	**45**	**80**

*There may be minor deviation in marks distribution.

BUILDING SCIENCE I
AR 506

Lecture : 3 **Year : II**
Tutorial : 1 **Part : I**
Practical : 0

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, 1975 "Manual of Tropical Housing and Building" – Orient Longman, Chennai, India,
2. S V Szokolay, A krishan, 2001 "Climate Responsive Architecture" – Tata McGraw- Hill, New Delhi, India
3. Esmond Reid "Understanding Building" -.
4. Er. B Pahari,2002"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, 1988 "Economic and Human geography of Nepal"- Education Enterprises, Nepal
8. J M Boch-Isaacson,1987 "Architecture & Construction management in the highland and remote areas of Nepal" - Sahayogi Press, Nepal
9. G Toffin, 1981"Man and His House in the Himalayas"- Sterling Publishers, India
10. S. Nienhuys, 2003, "Insulation for Houses in high altitudes" Renewable Energy Documents-2003, SNV Nepal
11. Different websites

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1	8	16
1 & 2	4 & 5	16
1 & 4	4 & 5	16
2 & 3	4 & 5	16
2 & 4	5 & 5	16
Total	**45**	**80**

*There may be minor deviation in marks distribution.

DESIGN STUDIO III
AR 501

Lecture : 0 **Year : II**
Tutorial : 0 **Part : I**
Practical : 10

Course Objective:

- Understand integration visual communication with design process.
- Understand nature of built environment, space and human scale through investigation & analysis
- 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 **Year : II**
Tutorial : 0 **Part : I**
Practical : 0

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 development (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

1. **South Asian Eastern civilization –Mohenjo –Daro and Harappa Settlements in Indus valley and Vedic Period (2 hours)**
2. **Development of Architecture principle and materials used in Buddhist rock cut. (4 hours)**
3. **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)**
4. **Introduction to Vastu Shastra (2hours)**
5. **Chronology study of Muslim Architecture emphasis on Mogul period (6 hours)**
6. **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:

- Banister Fletcher "A history of Architecture"
- Kostof Sriro "A History of Architecture: Settings and Rituals"
- Michal Raebum " Architectural of Western World"
- Jordan R. Fureaux "A Concise History of Western Architecture"
- Sierlin Henri "Encyclopedia of World Architecture"

- Crouch Dora "History of Architecture"
- James Steven Curi "Oxford Dictionary of Architecture"
- "The world Atlas of Architecture"
- P Brown "Indian Architecture"
- Prof. Suman Nandan Vaidya "Manual On History of Western Architecture"

Evaluation Scheme

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

Part A		
Chapters	**Hours**	**Marks distribution***
1,2	10	16
3,4	16	16
5,6,7	8	16
Part B		
1,2,3	14	16
4,5,6	12	16
Total	**60**	**80**

*There may be minor deviation in marks distribution.

STRUCTURE I
CE 507

Lecture : 3 **Year : II**
Tutorial : 1 **Part : I**
Practical : 0

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

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1, 2	10	16
3,4	9	16
3,9	9	16
5, 6, and 7	9	16
8	8	16
Total	**45**	**80**

*There may be minor deviation in marks distribution.

DESIGN THEORY I
AR 505

Lecture : 3 **Year : II**
Tutorial : 1 **Part : I**
Practical : 0

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. I'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
- 3.3.3 Each technic 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"

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1+3	7+5	8+8 = 16
2+4	4+4	8+8 = 16
2+4	4+4	8+8 = 16
3+4	5+4	8+8 = 16
3+4	5+4	8+8 = 16
Total	**45**	**80**

*There may be minor deviation in marks distribution.

BUILDING CONSTRUCTION III
AR 554

Lecture : 2 **Year : II**
Tutorial : 0 **Part : II**
Practical : 2

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 floors/ 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

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"

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1,2	6	8
3,4	8	8
5,6	6	8
7,8	6	8
9	4	8
Total	**30**	**40**

*There may be minor deviation in marks distribution.

Practical Assignments:

Units	Hours	No. of Sheets	Marks Distribution
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**

DESIGN THEORY II

AR 555

Lecture : 3 **Year: II**
Tutorial : 1 **Part : II**
Practical: 0

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. (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)**

   6.1.1 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.

   6.1.2 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.

   6.1.3 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"

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1,2	10	16
3,4	9	16
6	10	16
7	9	16
5 & 7	7	16
Total	**45**	**80**

*There may be minor deviation in marks distribution.

DESIGN STUDIO IV
AR 551

Lecture : 0 **Year : II**
Tutorial : 0 **Part : II**
Practical : 10

Course Objective:

- Understanding steps in design methodology through studio problems.
- Programming and formulation of concept in architectural studio assignments.
- Generation of Bubble Diagram to establish a functional relationship among various spaces.
- Application of climatic data, basic structural and social consideration in architectural design.
- 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 **Year: II**
Tutorial: 0 **Part: II**
Practical: 0

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"

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1.1	10	15
1.2	20	30
1.3	10	15
1.4	10	10
2,3,4	10	10
Total	**60**	**80**

*There may be minor deviation in marks distribution.

STRUCTURE II
CE 557

Lecture : 3 **Year : II**
Tutorial : 1 **Part : II**
Practical : 0

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

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1	6	12
2	12	20
3	6	12
4	6	12
5	15	24
Total	**45**	**80**

*There may be minor deviation in marks distribution.

SURVEYING
EC 558

Lecture : 4 **Year : II**
Tutorial : 0 **Part : II**
Practical : 4

Course Objective:

The objectives of this course are to introduce architectural engineering students with the fundamental knowledge of land measurement and surveying techniques. Overall course is designed to make the students able to learn and applying 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, fly 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 or 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

References:

1. R Banister and S Raymond "Surveying- ELBS" Latest edition
2. BC Punima "Surveying" Laxmi Publishers New Delhi
3. R. Agor "Surveying and Leveling" Khanna Publishers, Delhi
4. N N Basak " Surveying" Tata Mc Graw Hill Education Private Limited New Delhi

Evaluation Scheme:

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

Chapters	Hours	Marks distribution*
1,2	10	16
3,4	10	16
5	8	16
6, 7 & 8	14	16
9, 10, 11 & 12	18	16
Total	**60**	**80**

*There may be minor deviation in marks distribution.

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