**School of Architecture & Planning**

**Department of Architecture**

**Course Outline**

## UMT’s Vision

## ***Our Vision is... Learning***

It defines our existence, inspires all stakeholders associated with us, creates a powerful momentum inside, and responds to the challenges outside. It continues to evolve as present captures new realities and foresight to unfold new possibilities. All in an incessant attempt to help individuals and organizations discover their God-given potentials to achieve Ultimate Success actualizing the highest standards of efficiency, effectiveness, excellence, equity, trusteeship and sustainable development of global human society.

## UMT Mission

*Our Mission is.... Leading*

We aspire to become a learning institution and evolve as the LEADING COMMUNITY for the purpose of integrated development of the society by actualizing strategic partnership with stakeholders, harnessing leadership, generating useful knowledge, fostering enduring values, and projecting sustainable technologies and practices.

### Mission of the School

The mission of the School is to provide the best leadership in the fields of the built environment; particularly in the development, management and innovation in the fields of architecture, urban planning and related specializations and sub-specializations

### Mission of the Department

At the Department of Architecture our mission is to challenge the participants to develop their abilities in solving complex problems by thinking creatively & informed decision making as a core of their professional schooling. Offering them a diverse interdisciplinary and meticulous program of studies led by an adroit faculty in a comprehensive studios or class environment and preparing them for leadership roles in the field of Architecture, Construction, Landscape, Built Environment and community development.

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| --- | --- |
| **Program** | **BACHELOR OF ARCHITECTURE (B. ARCH)** |
| **Course**  | **AR-244 Structure For Architects-II** |
| **Credit Hours** | **2+0** |
| **Duration** | **One Semester** |
| **Prerequisites** | **Materials and Construction I & II****Structure For Architects-I**  |
| **Resource Person** |  **Beenish Mujahid & Arsala Hashmi** |
| **Counseling Timing** |  |
| **Contact** | **Mobile no.**  | **03233020100****03014541681** |
| **Email**  | **beenish.mujahid@umt.edu.pk****arsala.hashmi@umt.edu.pk** |

 **Instructor’s Signature ………………….**

**Chairperson Signature……………….**

**Dean’s signature…………**

**Date………………………………**

**Program Education Objectives**

**PEO-1:**

Able to interpret and elaborate architectural knowledge, communication, graphical and computer skills

**PEO- 2:**

Able to develop building and architectural plans through design coordination selecting suitable materials and construction techniques.

**PEO-3:**

Able to propose appropriate solution to complex building issues and adapt recent developments in architecture focusing on research, creativity and innovation.

**PEO-4:**

Able to maximize ethics by keeping spirit of discipline and respecting the professional codes and society.

**Program Learning outcomes PLO’s)**

Graduates of the B-Architecture at UMT are expected to have acquired and developed the following set of knowledge, skills and personality traits (these are also referred to as graduate attributes).

**PLO 1 Architectural Knowledge:** An ability to illustrate, architectural fundamentals through verbal and graphical Techniques

**PLO 2 Design Analysis and development:** An ability to identify literature and analyze architectural problems reaching substantiated conclusions to meet specified needs with appropriate societal and environmental consideration.

**PLO 3 Case study analysis:** An ability to analyze architectural issues in a methodical way including design, field surveys, interpretation of field data, and synthesis of information to derive valid conclusions.

**PLO 4 Digital Tool Usage:** An ability to create, select and apply appropriate techniques, resources, and modern architectural computer simulations, including prediction and modeling, to complex activities, with an understanding of the limitations.

**PLO 5 Environment and Sustainability:** An ability to propose sustainable solutions to environmental problems through architectural design thinking.

**PLO 6 Project Management:** An ability to demonstrate management skills and leadership qualities in individual and teamwork capacity.

**PLO 7 Design Coordination:** An ability to coordinate effectively across different sectors of construction industry. (Material suppliers, Electrical plumbing, HVAC and Civil works).

**PLO 8 Ethics and the society:** An ability to apply ethical principles and professional codes of the profession following the social norms to the best interest of the mankind.

**Course learning outcomes (CLO’s)**

After studying this course, the students will be able to:

1. Define different types of structural systems i.e. load bearing, frame, trussed, tensile, and shells. (C1)
2. Demonstrate selection criteria for appropriate structural systems (A3)
3. Experiment with structural design principles, and the capability of seeking practical design solutions for building structures (P2)
4. Analyze the conceptual design of structures for different types of loading: gravity and lateral loads (C4)
5. Evaluate structure for architectural design with other stakeholders of building construction (P4, P6)

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| --- | --- | --- | --- |
| **CODE** | **NAME** | **CLO** | **CLO Type** |
| 244.1 | 244.C1 | Define different types of structural systems i.e. load bearing, frame, trussed, tensile, and shells. | C1 |
| 244.2 | 244.C2 | Demonstrate selection criteria for appropriate structural systems  | A3 |
| 244.3 | 244.C3 | Builds the capability of seeking practical solutions for building structures with respect to structural design principles. | P2 |
| 244.4 | 244.C4 | Analyze the conceptual design of structures for different types of loading. | C4 |
| 244.5 | 244.C5 | Formulating a structural solutions for architectural design with other stakeholders of building construction. | P6 |

**Mapping of CLO’s to Program’s Learning Outcomes (PLO’S)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester** | **Course Code** | **Title** | **Course Learning outcomes** | **PLO 1: Architectural Knowledge** | **PLO 2: Design Analysis and Development** | **PLO 3: Case study analysis** | **PLO 4: Digital Tool Usage** | **PLO 5: Environment and Sustainability** | **PLO 6: Project Management** | **PLO 7: Design Coordination** | **PLO 8: Ethics and the Society** |
| **5th** | **AR-234** | **Structure for Architects -II** | Define different types of structural systems i.e. load bearing, frame, trussed, tensile, and shells. (C1) | √ |  |  |  |  |  |  |  |
| Demonstrate selection criteria for appropriate structural systems (A3) |  |  |  |  |  | √ |  |  |
| Builds the capability of seeking practical solutions for building structures with respect to structural design principles (P2) |  | √ |  |  |  |  |  |  |
| Analyze the conceptual design of structures for different types of loading. (C4) |  |  | √ |  |  |  |  |  |
| Formulating a structural solutions for architectural design with other stakeholders of building construction. (P6) |  |  |  |  |  |  | √ |  |

**Learning Methodology**

* Lectures as provided in the schedule of the semester activities
* Assignments related to all studied topics.
* Visits to different under constructed sites to understand different types of structures.
* Presentation on allocated topics.

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

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| --- | --- |
| Marks Evaluation | Marks in percentage |
| Quizzes | 15% |
| Assignments | 20% |
| Mid Term | 25% |
| Final exam | 40% |
| Total | **100%** |

**No. of Assignments**: 04

**No. of Quizzes** : 05, *wherein* 03 *(announced)* + 02 *(surprise)*

**Recommended Text Books**

1. **Building Structures Illustrated by Francis D.K.Ching**
2. **Building Construction Illustrated by Francis D.K.Ching**
3. Construction materials, methods and techniques by William P. Spence and Eva Kultermann
4. Modern Construction Handbook by Andrew Watts
5. Structure and Architecture by Angus J.Macdonald
6. Structural Detail in concrete by M.Y.H Bangash
7. Barry’s Advanced Construction of Buildings by Stephen Emmitt ,‎ Christopher A. Gorse
8. Building Construction by Varghese, P.C.
9. Construction Technology 2 Industrial and commercial building by Riley, Mike and Alison
10. Building Construction Principles, materials and systems Mehta , Madan, Armpriest, Danie
11. Construction Practice by Cooke and Brain
12. Structural Design: A Practical Guide for Architects By Rod Underwood & Michele Chiuini
13. Professional Building Construction Directory 1994 by Professional Publishers
14. Structural basis of architecture by Bjorn N.Sandaker, Arne P.Eggen & Mark R.Cruvellier
15. Structure for architects and Engineers by Philip Garrison
16. The Architect’s Studio Companion by Edward Allen and Joseph Iano

**Calendar of Course contents to be covered during semester**

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| --- | --- | --- | --- |
|  **Week** | **Activity** |  | **Reference** |
| Wk#1 | **Historical development of structural systems in Buildings*****Assignment # 1:*** *Pictorial presentation of 10 words from structure’s glossary.Size: A-2 card sheet.Condition: No internet Pictures* | C1 | Structure and Architecture by Angus J.MacdonaldChapter 1Building Structures Illustrated by Francis D.K.Ching |
| 2-3 | Basic structural PrinciplesStatics and the loadsDistribution of dead loads to framed Floor system-tributary areas.***Quiz 1****: Previous Lecture* | P2 | Chapter 2Structure and Architecture by Angus J.Macdonald |
| 4 | **Guest Lecture : Soil Mechanics** | P6 | Chapter 2The Architect’s Studio Companion by Edward Allen and Joseph Iano |
| 5 | Introduction to Concrete and R.C.C structures*Visit to Concrete Lab for understanding of field test.*Design criteria for the selection of structural system.Special Focus will be given to Masonry and Frame Structures.***Assignment # 2:*** *3d Model of 3 different types of Slab systemsSpecifications: 50’ x 50’ (Slab span) 1’x 1’ square column @ 10’ c/cScale= 3/16” = 1’-0”* | A3 | Chapter 8 Cast-in Place ConcreteConstruction, Materials, Methods and TechniquesBy William P. SpenceDesign of Concrete Structures by Arthur H.Nilson, David Darwin, Charles |
| 6 | Structural Patterns with special focus on gird types.***Quiz 2****: Surprise (same lecture)* | P2 | Chapter 2Building Structures Illustrated by Francis D.K.Ching |
| 7 | Different types of slabs* One-Way Solid Slab
* Two-Way Flat Plate
* Two-Way Flat Slab
* One-Way Joist
* Waffle Slab
* One-Way Beam and Slab
* Two-Way Beam and Slab

***Quiz 3****: Lectures till date* | C4 | Chapter 3Concrete Spanning SystemBuilding Structures Illustrated by Francis D.K.Ching |
| **Mid Term Exam** |
| 9 | Structural detailing of different types of slabs.Table of Three & design considerations of RCC members. ***Quiz 4****: Surprise (same lecture)****Assignment # 3:*** *Basement Grid Planning of existing project. On site analysis of Car parking. (Emporium Mall)* | P2 | Structural Detail in concrete by M.Y.H Bangash |
| 10 | Columns and failures in columnsReinforcement detail in columns. | C1 | Chapter 4Vertical DimensionsBuilding Structures Illustrated by Francis D.K.Ching |
| 11 | ***Site Visit***Bahria Town or Izhar Pvt Limited | C4 |  |
| 12 | Introduction to different types of Foundation***Assignment # 4:*** *Site Visit Report*  | C1 | Chapter 3Foundation SystemsBuilding Construction Illustrated by Francis D.K.Ching |
| 13 | Arcuated Structures:Domes & its Types & ComponentsTypes of Arches & Its structural considerationsHeighted Structures (Minarets) & their thumb rule calculations | C1 | Chapter # 25Arches, Domes & VaultsStructural Design: A Practical Guide for Architects By Rod UnderwoodMichele Chiuini |
| 14 | Lecture continue.Presentation & video documentary on case studies of residential and multi storey buildings. | C4 | Chapter # 7 High Rise StructuresBuilding Structures Illustrated by D.K Ching |
| **15-16** | ***Term Project : Structural Report of a design studio Mosque project****Present a report on mosque showing/analyzing structural systems provided in the Mosque.**The project is divided into two Phases as follows:****Phase I-Documentation****: Students will study any under construction mosque with reference to slab system and explore the selection criteria for different types of slabs in mosque.****Phase 2-Design:*** *Students will draw/discus/elaborate the plans of a mosque showing horizontal and vertical supporting members.**Determining heights of several mosque components as per structural thumb rules*  | P6 | Class Activity |
| 17 | Review of previous lectures & Discussion. | A3 | Class Notes |
| **Final Term Exam** |