University of Mumbai

No. AAMS(UG)/ 10 of 2022-23

CIRCULAR:-

Attention of the Principals of the Affiliated Colleges, Directors of the Recognized Institutions in Faculty of Science & Technology is invited to this office circular No. UG/170 of 2021 dated 26th November, 2021 relating to the amendment of O. 3701 relating to the B.E. Degree Course has been amended by incorporating New Nine Branches for Bachelor of Engineering.

They are hereby informed that the recommendations made by the Board of Studies in Civil Engineering at its meeting held on 18th November, 2021 and subsequently passed by the Board of Deans at its meeting held on 27th December 2021 vide item No. 6.2 have been accepted by the Academic Council at its meeting held on 28th December, 2021 **vide** item Nos. 6.2 and that in accordance therewith, the reduced syllabus for B.E. (Civil Infrastructure Engineering) (Rev-2019 'C' Scheme) for Direct Second Year (Sem.III) as Direct Second Year (DSE) students admission is delayed by the six months due to COVID-19 situation, has been brought into force with effect from the academic year 2021-22 Only. (The same is available on the University's website www.mu.ac.in).

(Sudhir S. Puranik)
REGISTRAR

MUMBAI – 400 032
4th May, 2022

To

The Principals of the Affiliated Colleges, and Directors of the Recognized Institutions in Faculty of Science & Technology.

A.C/6.2/28/12/2021

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No. AAMS(UG)/ 10 -A of 2022-23 4th May, 2022

Copy forwarded with Compliments for information to:-

1) The Dean, Faculty of Science & Technology,
2) The Chairman, Board of Studies Civil Engineering,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Director, Department of Information & Communication Technology,
6) The Co-ordinator, MKCL.

(Sudhir S. Puranik)
REGISTRAR

Copy for information and necessary action :-

1. **The Deputy Registrar, College Affiliations & Development Department (CAD),**
2. **College Teachers Approval Unit (CTA),**
3. **The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),**
4. **The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA)**
5. **The Deputy Registrar, Research Administration & Promotion Cell (RAPC),**
6. **The Deputy Registrar, Executive Authorities Section (EA)**
   He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
7. **The Deputy Registrar, PRO, Fort, (Publication Section),**
8. **The Deputy Registrar, Special Cell,**
9. **The Deputy Registrar, Fort Administration Department (FAD) Record Section,**
10. **The Deputy Registrar, Vidyanagari Administration Department (VAD),**

Copy for information :-

1. **The Director, Dept. of Information and Communication Technology (DICT), Vidyanagari,**
   He is requested to upload the Circular University Website
2. **The Director of Department of Student Development (DSD),**
3. **The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,**
4. **All Deputy Registrar, Examination House,**
5. **The Deputy Registrars, Finance & Accounts Section,**
6. **The Assistant Registrar, Administrative sub-Campus Thane,**
7. **The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,**
8. **The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,**
9. **P.A to Hon'ble Vice-Chancellor,**
10. **P.A to Pro-Vice-Chancellor,**
11. **P.A to Registrar,**
12. **P.A to All Deans of all Faculties,**
13. **P.A to Finance & Account Officers, (F & A.O),**
14. **P.A to Director, Board of Examinations and Evaluation,**
15. **P.A to Director, Innovation, Incubation and Linkages,**
16. **P.A to Director, Department of Lifelong Learning and Extension (DLLE),**
17. **The Receptionist,**
18. **The Telephone Operator,**

Copy with compliments for information to :-

19. **The Secretary, MUASA**
20. **The Secretary, BUCTU.**

AC – 28/12/2021
Item No. - 6.2

UNIVERSITY OF MUMBAI

Bachelor of Engineering
(Civil Infrastructure Engineering)

Direct Second Year (Sem. III) Admitted Students for the current Academic Year 2021-22 Only due to Covid Pandemic

(REV- 2019 'C' Scheme) from Academic Year 2019 – 20

Under
FACULTY OF SCIENCE & TECHNOLOGY

Program Structure for Second Year - Civil and Infrastructure Engineering

Semester III & IV

UNIVERSITY OF MUMBAI

(With Effect from 2021-2022)

Semester-III

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
CIC301	Engineering Mathematics – III	3	-	2	3	-	1	4
CIC302	Mechanics of Solids	4			4			4
CIC303	Modern Surveying	3			3			3
CIC304	Basics of Infrastructure and its planning	3	-	-	3	-	-	3
CIC305	Hydraulics	3	-	-	3	-	-	3
CIL301	Mechanics of Solids (Lab)	-	2	-	-	1	-	1
CIL302	Modern Surveying (Lab)	-	3	-	-	1.5	-	1.5
CIL303	Hydraulics (Lab)	-	2	-	-	1	-	1
CIL304	Skill Based Lab Course-I		3		-	1.5		1.5
CIM301	Mini Project– 1A	-	2	-	-	1	-	1
Total		**16**	**12**	**2**	**16**	**6**	**1**	**23**

Examination Scheme

Course Code	Course Name	Theory					Term Work	Prac. /Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs.)			
		Test I	Test II	Avg.					
CIC301	Engineering Mathematics – III	20	20	20	80	3	25	-	125
CIC302	Mechanics of Solids	20	20	20	80	3	-	-	100
CIC303	Modern Surveying	20	20	20	80	3	-	-	100
CIC304	Basics of Infrastructure and its planning	20	20	20	80	3	-	-	100
CIC305	Hydraulics	20	20	20	80	3	-	-	100
CIL301	Mechanics of Solids (Lab)	-	-	-	-	-	25	25	50
CIL302	Modern Surveying (Lab)	-	-	-	-	-	50	25	75
CIL303	Hydraulics (Lab)	-	-	-	-	-	25	25	50
CIL304	Skill Based Lab Course-I (CAD/ BIM)	-	-	-	-	-	50	-	50
CIM301	Mini Project– 1A	-	-	-	-	-	25	25	50
Total				**100**	**400**	**-**	**200**	**100**	**800**

Semester- III

Subject Code	Subject Name	Credits
CIC301	Engineering Mathematics – III	3

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorials	Total
03	-	02	03	-	01	04

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem. Exam	Duration of End Sem. Exam	TW	PR	OR	
Test-I	Test-II	Average						
20	20	20	80	03 hrs	25	-	-	125

Pre-requisite: Engineering Mathematics – I,

Engineering Mathematics – II.

Objectives

1. To understand the concepts of statistics for data analysis and its statistical tools and applications
2. To learn and apply the concept of Linear Bivariate Correlation and Regression
3. To understand the concepts of probability distributions and apply different ways of distribution.
4. To characterize and analyze the testing of Hypotheses.
5. To extrapolate using sampling theory and figure out its applications.
6. To investigate Variance and Covariance and analyze the data.

Detailed Syllabus

Module		Course Modules / Contents	Periods
1		**Basic Statistical tools, their applications and interpretations.**	06
	1.1	Introduction of Statistics: Definition of statistics, types of data, collection of data, tabulation of data, sampling techniques, cleaning of data techniques, Plotting of graphs and Diagrams using Microsoft Excel etc.	

	1.2	Measures of Central Tendencies: Mean, Median, Mode, Quartiles, Deciles, Percentile. Graphical Location of these measures, merits and de-merits	
	1.3	Measures of Dispersion, Range, coefficient of range, Mean deviation, Standard deviation, Variance, coefficient of Variation,standard error of prediction	
2	**Linear Bivariate Correlation and Regression**		**06**
	2.1	Concept of bi-variate linear correlation, Scatter diagram, types of Correlations, Karl Pearson;s product moment coefficient of correlations, Spearman's Rank Correlation Coefficient.	
	2.2	Bi variate Linear regression.	
3	**Probability Distribution**		**06**
	3.1	Elementary Probability Theory (Revision), Binomial distribution.	
	3.2	Poisson distribution, Normal distribution	
4	**Testing of Hypotheses**		**06**
	4.1	Basic concepts related to Testing of Hypothesis, Hypothesis testing of means, for difference between the means, Hypothesis testing for comparing two related samples.	
	4.2	Hypothesis testing of proportions, between the proportions, for comparing variance to some hypothesized population variance, Limitations of tests of hypotheses.	
5	**Sampling and large sample tests**		**06**
	5.1	Basic sampling techniques, Chi-square test, student's t-test, F-test , Z-test	
	5.2	Random, Systematic, Convenience, Cluster, and Stratified sampling.	
	5.3	Sampling size, sampling errors.	
6	**Analysis of Variance and Covariance**		**09**
	6.1	ANOVA, its basic principles, two-way ANOVA. Analysis of Covariance (ANOCOVA)	
	6.2	MATLAB Commands and functions, Data representation in MATLAB, Basic arithmetic operations in MATLAB. MAXIMA. symbolic computation, including differentiation and integration. Floating-point arithmetic and arbitrary-precision arithmetic. SAGEMATH. User Interfaces, Graphics, Mathematics, Parents and Categories.	
		Total	**39**

Contribution to Outcome

Learner will be able to….

1. Illustrate use of statistics for data analysis and apply it to real problems.
2. Employ the concept of Linear Bivariate Correlation and Regression.
3. Express probability distributions using proper technique.
4. Break down the data by means of testing of Hypotheses.
5. Correlate the data with the help of concept of sampling theory.
6. Manage the data by the virtue of Analysis of Variance and Covariance.

Term Work:

General Instructions: Batch wise tutorials are to be conducted. The number of students per batch should be as per University pattern for practical.

Students must be encouraged to write at least 6 class tutorials on entire syllabus.

Four tutorials will be based on:

i) MATLAB Commands and functions, Data representation in MATLAB, Basic arithmetic operations in MATLAB

ii) MAXIMA. Computer algebra system, symbolic computation, including differentiation and integration. floating-point arithmetic and arbitrary-precision arithmetic.

iii) SAGEMATH. User Interfaces, Graphics, Mathematics- Parents and Categories The distribution of Term Work marks will be as follows:

1	Attendance (Theory and Tutorial)	05 marks
2	Class Tutorials on entire syllabus	10 marks
3	MATLAB, MAXIMA and SAGEMATH Practical's	10 marks

Internal Assessment for (20 marks)

Consisting Two Compulsory Class Tests First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I). Duration of each test shall be one hour.

End Semester Examination (80 marks)

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1) Question paper will comprise of total six questions, each carrying 20 marks
2) Question 1 will be compulsory and should cover maximum contents of the curriculum
3) Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module
4) Only Four questions need to be solved.

Recommended Books:

1. Engineering Mathematics: Dr. B. S. Grewal, Khanna Publication
2. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley Eastern Limited
3. Advanced Engineering Mathematics: R. K. Jain and S.R.K. Iyengar, Narosa publication
4. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley Eastern Limited
5. Advanced Engineering Mathematics: R. K. Jain and S. R. K. Iyengar, Narosa publication
6. Probability Statistics and Random Processes: T. Veerarajan, Mc. Graw Hill education.

Semester- III

Course Code	Course Name	Credits
CIC302	Mechanics of Solids	4

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
4	-	-	4	-	-	4

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem. Exam	Duration of End Sem. Exam	TW	PR	OR	
Test-I	Test-II	Average						
20	20	20	80	3 Hrs	-	-	-	100

Rationale

Civil Engineering structures are made using various engineering materials such as steel, concrete, timber, other metals or their composites. They are subjected to force systems resulting in to axial forces, bending moments, shear forces, torsion and their combinations. Different materials respond differently to these by getting deformed and having induced stresses. Determination of stress, strain, and deflection suffered by structural elements when subjected to diverse loads is prerequisite for an economical and safe design.

In this course, learners will understand the behaviour, determine the internal forces and analyses the stresses of various structural element under action of different type of force systems. The knowledge of 'Mechanics of Solids' will be foundation of essential theoretical background for the subjects of Structural Analysis and Structural Design.

Objectives

1. To compute area moment of inertia and to learn stress - strain behavior and physical properties of materials and to compute the Stresses developed and estimate deformation of Elastic members under the action of axial forces and temperature change.
2. To learn relationship of distribution of axial force, shear force and bending moment for the loaded, statically determinate beams and portal frames and learn to represent graphically.

3. To analyze the distribution of shear stress and the flexural (bending) stress across the cross section of structural members.
4. To analyze and estimate the direct and bending stresses in columns and study buckling behavior of centrally and eccentrically loaded columns.
5. To analyze and determine the slope and deflection of elastic beams and general theorems used in this computation.
6. To relate the action of twisting moment with geometry of circular shafts and to determine strain energy stored in elastic members.

Detailed Syllabus

Module		Course Modules / Contents	Periods
1	**Moment of Inertia and Simple Stresses and Strains**		**(3)**
	1.1	**Simple Stresses and Strains:** Types of Stresses and Strains, stress-strain curve, different types of Elastic moduli and relationships between them, Poisson's ratio, factor of safety. Bars of varying sections, composite sections, temperature stresses	
2	**Axial force, shear force and bending moment diagrams for beams and portal frames**		**(5)**
	2.1	Concept of Axial Force, Shear Force and Bending Moment. a) Axial Force Shear Force Diagrams forstatically determinate Simply Supported and Cantilever **beams without internal hinges** and for single loading like point load, UDL,UVL or Couple moment. b) Axial Force Shear Force and Bending Moment Diagrams for statically determinate **beams with internal hinges** and combination of loading.	
	2.2	Axial Force Shear Force and Bending Moment Diagrams for statically determinate **3-member Portal Frames without internal hinges.**	
3	**Shear stresses and Bending stresses in beams**		**(3)**
	3.1	Theory of pure bending, simple problems involving application of Flexure formula, section modulus, moment of resistance, flitched beams.	
4	**Stresses and Deflection of columns**		**(3)**
	4.1	Buckling of Columns, Members subjected to axial loading, concept of buckling, effective length, different support conditions, Determination of crippling load by Euler's and Rankine's formula.	
5	**Slope and Deflection in Beams**		**(3)**

	5.1	General Theorems of Slope and Deflection: Betti and Maxwell Reciprocal Theorem, Principle of Superposition, Principalof Virtual work. Application of Unit Load Method and Strain Energy Method (Virtual Work Method/ Dummy Load Method) for finding out slope and deflection in beams.	
6	**Torsion of Shafts and strain energy**		**(5)**
	6.1	Torsion in solid and hollow circular shafts, Shafts transmitting and receiving power at different points. Stresses in Shafts while transmitting power.	
	6.2	Strain energy stored due to axial force (due to gradual, sudden and impact load) in regular solid and hollow bars. Strain Energy stored due to bending of beams. Strain energy stored in memberdue to torsion.	
		Total	**(22)**

Contribution to Outcome

On completion of the course, learner will be able to:

1. Understand concept of stress-strain and determine different types of stress, strain in determinate homogeneous and composite structures and Calculate Moment of Inertia for cross sections.
2. Calculate shear force and bending moment in statically determinate beams and portal frames for different loading conditions and illustrate axial force, shear force and bending moment diagram.
3. Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
4. Compute direct and bending stresses developed in the cross section of centrally and eccentrically loaded columns.
5. Evaluate slope and deflection of beams supported and loaded in different ways.
6. Use theory of torsion to determine the stresses in circular shaft and to calculate strain energy stored in members due to elastic deformation.

Internal Assessment (20Marks):

One **Compulsory Class Test,** based on approximately 40% of contents and another on 40% from the remaining content is taken. Average of the two will be considered as IA Marks.

End Semester Examination (80Marks):

Weightage of each module in end semester examination will be proportional to number of respective lectures.

Hours mentioned in the curriculum.

1. Question paper will comprise of total **six questions**, **each carrying 20 marks.**
2. **Question 1**will be **compulsory** and should **cover maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any module other than module3) OnlyFour questions need to be solved.

Recommended Books:

1. Strength of Materials: S. Ramamrutham, Dhanpatrai Publishers.
2. Strength of Materials: R. K. Rajput, S. Chand Publications.
3. Mechanics of Materials: Vol-I: S. B. Junnarkar and H. J. Shah, Charotar Publications.
4. Strength of Materials: Subramanian, Oxford University Press
5. Strength of Materials: S. S. Rattan, Tata Mc-Graw Hill, New Delhi
6. StrengthofMaterials(MechanicsofMaterials):R.S.LehriandA.S.Lehri,S.K.Katari a Publishers, New Delhi
7. Strength of Materials: Dr. V. L. Shah, Structures Publications, Pune

Reference Books:

8. Mechanics of Materials: James, M. and Barry J. ;Cengage Learning.
9. Mechanics of Materials: Andrew Pytel and Jaan Kiusalaas, Cengage Learning.
10. Mechanics of Materials: Timoshenko and Gere, Tata McGrawHill, New Delhi.
11. Mechanics of Materials: James M .Gere, Books/Cole.
12. Strength of Materials: G. H. Ryder, Mc-Millan.
13. Mechanics of Materials: E. P. Popov, Prentice Hall India (PHI) Pvt. Ltd.
14. Mechanics of Materials: Pytel and Singer, Mc-GrawHill, NewDelhi.
15. Strength of Materials: William A. Nash and Nillanjan Mallick, Mc Graw Hill BookCo. (Schaum's Outline Series)

Semester- III

Course Code	Course Name	Credits
CIC303	Modern Surveying	03

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorials	Total
03	-	-	03	-	-	03

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem. Exam	Duration of End Sem. Exam	TW	PR	OR	
Test-I	Test-II	Average						
20	20	20	80	03 Hrs	-	-	-	100

Rationale

Surveying is the scientific technique to determine the position of points and angles & distances between them. The process of surveying is necessary to accomplish all civil engineering works or projects successfully like highways, railways, bridges, airports, harbours, canals, dams reservoir sand waste water disposal.

In this core subject, students will learn about the principles and methods in surveying. They will study various conventional instruments which are used in the field for surveying.

For all infrastructures projects, very precise measurements are needed. Thus, the use of modern equipment and methods has become standard. It allows the gathering of much more accurate data in a time-efficient manner and aids in creating the best design possible. Students will learn about the Modern Surveying Instruments and methods, their suitability and applications.

Objectives

The students will be able to:

1. Understand appropriate principles and methods of surveying based on accuracy and precision required as per the availability of resources, economics and duration of the project.
2. Learn to apply the technique for measurement of distances in vertical plane using surveying instruments.
3. Compare direct and indirect methods of measurement and decide the suitable method.
4. Acquire the knowledge of different curves and estimate the quantities.

5. Understand the Modern Surveying Instruments and methods and their suitability.
6. Demonstrate applications of modern instruments and techniques to real problem.

Detailed Syllabus

Module		Course Modules / Contents	Duration
1	**Introduction**		**03**
	1.1	Definition, principles, objectives, fundamental classification-plane and geodetic.	
	1.2	Chaining, Ranging and offsetting: Definitions, Principles, conventional signs and symbols.	
	1.3	Bearings – Different types, compass – prismatic, surveyor, dip, declination and local attraction	
2	**Levelling and Contouring**		**03**
	2.1	Basic terms, principal axes of dumpy level, temporary and permanent adjustments.	
	2.2	Booking and reduction of levels.	
3	**Theodolite Surveying**		**04**
	3.1	Various parts and axes of transit, technical terms	
	3.2	Theodolite traverse, Latitudes and departures, traverse adjustments	
	3.3	Tacheometery - Principle, Objective, Suitability and different methods of tacheometery	
4	**Curves**		**04**
	4.1	Horizontal Curves - Definitions of different terms, necessity and types of curves. Methods of setting out Simple circular curves- linear methods and Angular methods (Numericals on simple circular curves only).	
	4.2	Vertical curves – Definitions .	
5	**Introduction to Modern Surveying Instruments Techniques**		**03**
	5.1	Total Station	
	5.2	GPS	
	5.3	GIS	
6	**Application of Modern Surveying Techniques**		**03**
	6.1	Application of Total Station, GIS, GPS,LIDAR, Drones.	

Total	**20**

Contribution to Outcome

After completion of the course, the learner will be able to:

1. Apply the principles and methods of surveying for project works.
2. Measure distances in vertical plane accurately.
3. Suggest solutions to the surveying field problems.
4. Apply the geometric principles for computing data and preparation of drawings.
5. Highlight the improvements in modern surveying instruments/techniques.
6. Use modern surveying tools to solve day to day surveying field problems.

Internal Assessment (20 marks):

Consisting of Two **Compulsory Class Tests:**

First test based on approximately 40% of the contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I)

End Semester Examination (80 marks):

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum

1. The question paper will consist of **six questions, each carrying 20 marks.**
2. **Question 1** will be **compulsory** and should cover **maximum contents of the curriculum**
3. **Remaining questions will be mixed in nature**(for example if Q.2 has part (a) from module3 then part (b) will be from any other module other than module- 3)
4. Only **Four questions need to be solved.**

Recommended Books:

1. Surveying and Levelling: R. Agor, Vol. -I, 11th Edition, Khanna Publishers (ISBN8174092358)
2. Surveying and Levelling: Kanetkar and Kulkarni, Vol.-I, 24th Edition, Pune Vidyarthi Griha, Pune. (ISBN 8185825114)
3. Surveying and Levelling: Dr. B.C. Punmia, Vol.-I, 16th Edition, Vol. -II 4th Edition,Laxmi Publications (ISBN9788170088530)
4. Surveying and Levelling: N N Basak, 2nd Edition, Tata McGraw Hill, New Delhi. (ISBN9789332901537)

5. Remote Sensing and GIS: B Bhatia, Oxford University Press, New Delhi.
6. Remote Sensing and Geographical Information Systems: M. Anji Reddy, B.S.Publications, Hyderabad, 2001
7. Concepts and Techniques of Geographic Information Systems: Lo, C.P. & Yeung A.K.W., PrenticeHall of India, New Delhi, 2002

Reference Books:

1. Surveying: Volume - I: Dr K.R. Arora, Standard Book House.
2. Surveying and Levelling (2nd Edition): R. Subramanian; Oxford Higher Education.
3. Surveying and Levelling (Vol.-I): S.K. Duggal, Tata McGraw Hill
4. Textbook of Surveying: C Venkatramaiah, University Press, Hyderabad, Latest Edition
5. Fundamentals of Surveying: S.K. Roy, Prentice Hall India, New Delhi
6. Surveying for Engineers: John Uraine and Bill Price, Palgrave Macmillan
7. Surveying: Theory and Practice, James Anderson, Edward M. Mikhail, Tata Mcgraw Hill
8. GIS, Spatial Analysis, and Modeling: Maguire, D., M. Batty, and M. Goodchild 2005.ESRI Press(070.212.05842005)
9. Global Positioning System: Signals, Measurements, and Performance, Pratap Misra andPerEnge (2nd Ed.), 2006.
10. Remote Sensing Principles and Interpretation: Floyd, F. Sabins, Jr:, Freeman and Co.,SanFranscisco,1978.
11. Geographic Information System and Science: Longley, Paul A., Michael F. Goodchild, David J.Maguuire, David W. Rhind, John Wiley and Sons, New York (2nd Ed.), 2005.

Semester- III

Subject Code	Subject Name	Credits
CIC 304	Basics of Infrastructure and its Planning	3

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorials	Total
03	-	-	03	-	-	03

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem. Exam	Duration of End Sem. Exam	TW	PR	OR	
Test-I	Test-II	Average						
20	20	20	80	03 Hrs	-	-	-	100

Rationale

Infrastructure is the resources required for a society and its economy to function. It is instrumental in promoting economic growth of a nation. Infrastructure Planning primarily relates to new cost-effective infrastructure creation. Proper and consistent infrastructure planning and management is vitally important; it is crucial to the daily lives of millions of people. Infrastructure planning is primarily concerned with identifying the needs, the modes of operation, resources required, and financial implications of specific infrastructures. It focuses on managing, planning, and utilizing a facility.

In this course students will learn about Urban Infrastructure & Planning issues. The basics of infrastructure planning with respect to Housing and Industrial Development, Transportation Infrastructure, Water Supply & Irrigation and Power infrastructure will also be studied during this course.

Objectives

1. To understand the fundamentals of urban infrastructure and issues of urban planning.
2. To understand the housing development in urban and rural area and develop planning &designing of houses and housing complexes.
3. To understand the basics of industrial planning along with concepts in industrial development
4. To learn planning of the transportation infrastructure, and develop network system for the efficient transportation.

5. To summarize water management systems for water supply and irrigation.
6. To learn to prepare an outline for power generation at its sources and distribution of power.

Detailed Syllabus

Module	Course Modules / Contents		Periods
1	**Urban Infrastructure & Urban Planning issues**		3
	1.1	Introduction to Infrastructure & Planning fundamentals/concepts	
	1.2	Principles of Urban Infrastructure Management & Uses, Role of Government, Municipality, Architect, Civil Engineers,Contractors.	
	1.3	Urban Land Use Planning , Role of MMRDA, MSRDC, MHADA and CIDCO.	
2	**Housing Development**		3
	2.1	Introduction to Housing , its importance in Urban & Rural areas	
	2.2	Concepts for Planning, Designing for different types of Houses for all the types of income groups	
	2.3	Study of Planning concepts for Residential Buildings	
3	**Industrial Development**		3
	3.1	Introduction to various types of Industries & its uses in Economic development of any Region	
	3.2	Study of development of Industries and planning concepts	
4.	**Transportation Infrastructure**		4
	4.1	Introduction to Transportation & its importance	
	4.2	Types of Transportation systems & networks, Planning concepts, Land acquisition for Transportation	
5.	**Urban Water Supply & Irrigation**		4
	5.1	Introduction to Water supply, Irrigation purpose	
	5.2	Planning concepts for water supply design, layouts, construction parameters	
	5.3	Planning concepts for Irrigation projects	

6.	**Power Generation & Distribution**		**3**
	6.1	Power requirement for Residential Development	
	6.2	Sources for Power Generation	
	6.3	Types of Power Plants	
	6.4	Infrastructure Development for distribution of Power	
		Total	**20**

Contribution to Outcome

Students will have the ability to:

1. Apply the infrastructural fundamentals and other issues in this regards.
2. Understand the requirements of housing development in urban and rural area.
3. Understand the basics of industrial development for the economic development of region.
4. Develop critical thinking on planning of transportation system, and importance for development of area.
5. Analyze the planning, designing and construction parameters for urban water supply and irrigation.
6. Prepare an outline of plan from source of power generation, types of plant and infrastructural development for distribution of power

Theory Examination:

1. The question paper will comprise of **six** questions; each carrying 20 marks.
2. The **first** question will be **compulsory** that will have short questions having weightage of 4-5 marks covering the entire syllabus.
3. The remaining **five** questions will be based on all the modules. For this, the module shall be divided proportionately further, and the weightage of the marks shall be judiciously awarded in proportion to the importance of the sub-module and contents thereof.
4. There can be an **internal** choice in various sub-questions/ questions in order to accommodate the questions on all the topics/ sub-topics.
5. The students will have to attempt any **three** questions out of remaining five questions.
6. A total of **four** questions need to be attempted.

Recommended Books:

1. Infrastructure planning handbook:Planning, Engineering, and Economics. Goodman A S, Hastak M (2006): New York: ASCE Press.
2. The strategic management of largeengineering projects: Shaping institutions, risks, and governance. Miller R, Lessard DR (2001): MIT press.
3. Infrastructure Planning and Management (2018): Prof. Ashwin Mahalingam NPTEL. https://nptel.ac.in/courses/105/106/105106188/
4. Infrastructure planning: J. Parkin and D. Sharma, Thomas Telford, London, 1999.
5. Planning, analysis, selection, financing, implementation, and review: P. Chandra, Projects: Tata McGraw-Hill, New Delhi, 2009.
6. Project Management : Vasant Desai, Himalaya Publishing , 1st Edition, 2010
7. Engineering Contracts and Arbitration‖, B. J. Vasavada, ― Jubilee publications, 2nd Edition., 1996

8, Construction Management & PWD Accounts --- D Lal, S. K. Kataria & Sons, 2012

9. Construction project scheduling and control --------Mubarak, Wiley India
10. Construction Management: Planning and finance-- Cormican D. Construction press, London, Feb 2002.
11. Engineering Economics—Kumar ------ Wiley, India
12. Projects planning, Analysis Selection, Implementation and Review, Prasanna ChandraTata McGraw Hill, New Delhi, 2005
13. Fundamentals of Engineering Economics - Pravin Kumar, Wiley, India

Semester- III

Subject Code	Subject Name	Credits
CIC 305	Hydraulics	3

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorials	Total
03	-	-	03	-	-	03

Theory					Term Work/ Practical/Oral			Total
Internal Assessment			End Sem. Exam	Duration of End Sem. Exam	TW	PR	OR	
Test-I	Test-II	Average						
20	20	20	80	03 Hrs	-	-	-	100

Rationale

In Civil & Infrastructure engineering, the course of Hydraulics has been included to understand the Science of fluids. The course deals with the basic concepts of properties of Fluids, Fluid processes and Kinematics and hydrodynamics with their applications in fluid flow problems. Water infrastructure generally consists of water supply system comprising of network of pipes, channels from ground water to reservoir to consumer. Reservoirs, pipes, turbine and pumps are basic components of system and it is very essential to have knowledge about it.

The course deals with the basic concepts of properties of fluids, fluid kinematics and hydrodynamics with their applications in fluid flow problems. In this course, learners will understand the behaviour of Fluid under different conditions. The knowledge of 'Hydraulics' will be foundation of essential theoretical background for the subjects of Water Resources and Management Engineering as well as Environmental Engineering.

Objectives

1. To understand the different properties of fluids, pressure measurement, manometer, and hydrostatic forces acting on different surfaces, principle of buoyancy and stability of floating body.
2. To understand the Kinematic and Dynamic behaviour through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations to measure pipe bend problem.

3. To adapt and calculate various pipe flow losses, discharges in pipe network by Hardy cross method and power transmission through nozzle.
4. To understand working principle, classification, efficiencies of different types of Turbines.
5. To study centrifugal pumps, reciprocating pumps.
6. To understand prototypes, dimensionless numbers, dimensional analysis and model laws

Detailed Syllabus

Module		Course Modules / Contents	Periods
1	**Properties of Fluid**		04
	1.1	Various Properties of Fluids, Pressure of a Liquid, Pascal's law, Types of pressure	
	1.2	Buoyancy and floatation: Archimedes Principle, Metacenter, Metacentric height, Determination of metacentric height.	
	1.3	Fluid Kinematics: - Rate of discharge, Equation of Continuity, types of flows in pipe.	
2	**Dynamics of Fluid Flow**		04
	2.1	Different types of Energies or Head of a Liquid in Motion, Equation of motion, Bernoulli's Equation for Real fluid.	
	2.2	Practical Application of Bernoulli's Equation, Venturimeter. Classification of notches and weirs, discharge over a rectangular, notch/weir.	
3	**Flow through pipes**		04
	3.1	Loss of head through pipes, Major and minor losses.	
	3.2	Hydraulic gradient line and Total energy gradient line.	
	3.3	Pipes in series, equivalent pipes, pipes in parallel,	
	3.4	Flow through Branched pipes.	
	3.5	Pipe network	
4	**Turbines**		04

	4.1	Force exerted by jet on plate, jet striking at center and striking at tangentiallyat one end (including velocity triangle diagram) .	
	4.2	General layout, heads, efficiencies of turbine, classification.	
	4.3	Concept, working of Pelton wheel turbine	
5	**Pumps**		**3**
	5.1	Centrifugal pumps, work done, heads, efficiencies.	
6	**Dimensional Analysis**		**3**
	6.1	Dimensional homogeneity, Buckingham's π theorem.	
	6.2	Different Model laws.	
		Total	**22**

Contribution to Outcome

After completion of the course work, students will be able to,

1. Describe various properties of fluids and types of flows. Determine the pressure difference in pipe flows, application of Continuity equation and Bernoulli's theorem to determine velocity and discharge.
2. Apply the concepts of fluid dynamics to solve fluid flow problems.
3. Analyze major, minor friction losses through pipes, nozzles and apply it for solvingcomplex water supply network problems by Hardy cross method.
4. Explain the working, functioning, of Francis, Kaplan and Pelton wheel turbines.
5. Explain the working, functioning and design of Centrifugal pumps, its efficiencies and study reciprocating pump.
6. Explain the importance of dimensionless numbers, dimension analysis and similarity behaviour of model and prototype

Internal Assessment (20 Marks):

Consisting of Two Compulsory Class Tests: First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I).

End Semester Examination (80 Marks):

Weightage of each module in end semester examination will be proportional to number of respective lecture hours mentioned in the curriculum.

1. Question paper will comprise of total six questions, each carrying 20 marks.
2. Question 1will be compulsory and should cover maximum contents of the curriculum
3. Remaining questions will be mixed in nature (for example if Q.2 has part (a) from module 3 Then part (b) will be from any module other than module 3)
4. Only Four questions need to be solved.

Oral Examination:

The oral examinations shall be based on the entire syllabus, the report of the experiments conducted by the students including assignments.

Recommended Books:

1. Hydraulics and Fluid mechanics: Dr. P.M. Modi and Dr. S.M. Seth, Standard Book House, Delhi
2. Theory and Application of Fluid Mechanics: K. Subramanian, Tata McGraw hill publishing company, New Delhi.
3. Fluid Mechanics: Dr. A.K Jain, Khanna Publishers.
4. Fluid Mechanics and Hydraulics: Dr. S.K. Ukarande, Ane Books Pvt.Ltd. (Revised Edition 2012), ISBN 97893 8116 2538
5. Fluid Mechanics and fluid pressure engineering: Dr. D.S. Kumar, F.K. Kataria and sons
6. Fluid Mechanics: R.K. Bansal Laxmi Publications (P) Ltd.
7. Fluid Mechanics I & II: Dr. Atulya Patil, C Jamanadas Publication.

Reference Books:

8. Fluid Mechanics: Frank M. White, Tata McGraw Hill International Edition.
9. Fluid Mechanics: Streeter White Bedford, Tata McGraw International Edition.
10. Fluid Mechanics with Engineering Applications: R.L. Daugherty, J.B. Fanzine, E.J. Fennimore, Tata McGraw Hill, New Delhi.
11. Hydraulics: James F. Cruise, Vijay P. Singh and Mohsen M. Sherif, CENGAGE Learning India (Pvt.) Ltd.
12. Introduction to Fluid Mechanics: Edward J. Shaugh nessy, Jr, Ira M. Katz, James P. Schaffer Oxford Higher Education.

Semester- III

Subject Code	Subject Name	Credits
CIL 301	Mechanics of Solids (Lab)	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	02	-	-	01	-	01

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test-I	Test-II	Average						
-	-	-	-	-	25	-	25	50

Objectives

1. To learn stress-strain behavior and physical properties of materials and to compute the Stresses developed and deformation of Elastic members.
2. To learn computing the compressive stress in structural members.
3. To learn computing the flexural (bending) stress across the cross section of structural members.
4. To study the behavior of circular shafts under the action of twisting moment
5. To learn the concept of amount of energy absorbed by the material during fracture.
6. To learn the computation of slope and deflection of elastic beams and make use of general theorems used in this computation.

Term Work:
Term work comprises of Laboratory work and assignments.
Laboratory work: (At least 6-Performances –Any one from each Module)

Mechanics of Solids (Practical performance)		
Exp. No.	**Name of Experiment**	**Duration (Hours)**
1	1. Using UTM find different Moduli of a material or 2. The Tension Test on M S rod or 3. The Tension Test on M S Flat	**2**
2	1. The Compression Test on Concrete cube or 2. The Compression Test on Timber or 3. The Compression Test on Brick	**2**
3	1. Using Torsion Testing Machine, verify the torsion equation, find different Moduli of a material. or 2. Spring Stiffness Test using strain gauges or other electronic devices	**2**
4	1. Charpy impact testing and Energy concept. or 2. Izod impact testing and Energy concept.	**2**
Total Duration = 12 Hours		

Assignment:

(At least 1 from each module as per the Course instructor's guidelines; it is to be assessed during Laboratory hours. In order to avoid Copying/ repetition, Course Instructor may give different assignments to different groups.)

Mechanics of Solids		
Schedule	**Assignment**	**Duration (Hours)**
2nd week	**Stresses and strains in Elastic members, Spherical and Cylindrical shells** 1. Prepare a model of Cylindrical vessel or 2. Prepare a model of spherical vessel or 3. Prepare a model of Cylindrical vessel with hemispherical ends or 4. Prepare a chart showing diagrammatic representation of stresses or 5. A set of 5 questions on a module designed by course instructor, or 6. A site visit to a relevant place or 7. A model / chart based on a module or 8. Design of a new experiment based on a module or 9. Write a Computer program in C++ or MS Excel on how to finda particular quantity from given data (Ex: Find output, Elongation 'б' from the input values of P,L,A and E) 10. A chart about scientists and their contribution to the study of 'Mechanics of Solids' (Example given at the end of this document – Appendix I)	**2**
4th week	**Axial force, shear force and bending moment diagrams for beams and portal frames** 1. A set of 5 questions on a module designed by course instructor, or 2. A site visit to a relevant place or 3. A model / chart based on a module or 4. Design of a new experiment based on a module or 5. A chart about scientists and their contribution to the study of 'Mechanics of Structures' (Example given at the end of this document) or	**2**
	6. Prepare a chart showing AFD, SFD & BMD for different symmetric and asymmetric loads on S S beams or 7. Prepare a chart showing AFD, SFD & BMD for different loads on Cantilever beams.	

6th week	**Area Moment of Inertia, Bending stresses and Shear stresses in beams** 1. Prepare a chart showing MI @ XX, YY &ZZ axes passing through the centroid. or 2. Prepare 3D models of different typical cross sections of beams and find their cross sectional area, Ixx, Iyy and Izz.. or 3. Prepare charts showing typical cross sections and variation of Bending stresses and shear stresses across the cross section. or 4. A set of 5 questions on a module designed by course instructor, or 5. A site visit to a relevant place or 6. A model / chart based on a module or 7. Design of a new experiment based on a module or 8. Write a Computer program in C++ or MS Excel on how to find a particular quantity from given data (Ex: Find output, Flexural stress 'f' from the input values of P,L,I and E) 9. A chart about scientists and their contribution to the study of 'Mechanics of Structures' (Example given at the end of this document)	**2**
8th week	**Columns** 1. Prepare 3D models of different solid and hollow circular cross sections of shafts and find their cross sectional area, Ixx, Iyy and Izz. or 2. A set of 5 questions on a module designed by course instructor, or 3. Write a Computer program in C++ or MS Excel on how to find a particular quantity from given data (Ex: Find output, Shear stress 'q' or angle 'Ɵ' from the input values of T,L,G and J) 4. A site visit to a relevant place or 5. A model / chart based on a module or 6. Design of a new experiment based on a module or 7. A chart about scientists and their contribution to the study of 'Mechanics of Solids' (Example given at the end of this document)	**2**

10th week	**Torsion of Shafts, Strain Energy** 1. Draw typical stress transformation cases of Mohr's circle using graph paper. or 2. A set of 5 questions on a module designed by course instructor, or 3. A site visit to a relevant place or 4. A model / chart based on a module or 5. Design of a new experiment based on a module or 6. A chart about scientists and their contribution to the study of 'Mechanics of solids' (Example given at the end of this document)	**2**
12th week	**Slope and Deflection in Beams ; General Theorems** 1. Prepare chart to explain General theorems for slope and deflection. or 2. A set of 5 questions on a module designed by course instructor, or 3. A site visit to a relevant place or 4. A model / chart based on a module or 5. Design of a new experiment based on a module or 6. A chart about scientists and their contribution to the study of 'Mechanics of Solids' (Example given at the end of this document)	**2**
	Total Duration =	**12 Hrs.**

Outcomes

Learner will be able to…

1. Evaluate stress-strain behavior of materials and assess the structural behavior by the virtue of stresses developed and deformation of elastic members.
2. Analyze the material response under the action compression and compute the compressive stress in structural members.
3. Evaluate flexural (bending) stress across the cross section of structural members like beams supported and loaded in different ways.
4. Predict the angle of twist and shear stress developed in torsion.
5. Analyze the material response under the action of impact load.
6. To make the computation of slope and deflection of elastic beams and apply general theorems used in this computation.

Appendix -I:

A chart about scientists and their contribution to the study of 'Mechanics of solids' be made by students. Contributions of Scientists like Giordano Riccati, Leonhard Euler, Saint Venant, Christian Otto Mohr, William J M Rankine, Carlo Castigliano, Enrico Betti, Robert Hooke, W. H.Macaulay, Augustin- Louis Cauchy, Simeon Poisson can be studied and presented.

Important Websites:

1. http://www.iitk.ac.in/mseold/mse_new/facilities/laboratories/MaterialTestingLab/MSE313A.pdf
2. https://home.iitm.ac.in/kramesh/Strength of Materials Laboratory Manual.pdf
3. https://www.researchgate.net/publication/338139499_Me_8381-Strength_Of_Materials_Lab_Manual

Assessment:

To be done after 13th week

Term Work:

Including Laboratory Work and Assignments both, Distribution of marks for Term Work shall be as follows:

Laboratory work- : 15 Marks
Assignments- : 10 Marks

The sum will be multiplied by a factor of attendance between (for poor attendance) to 1 (verygood attendance).

End Semester Oral Examination

Oral examination will be based on entire syllabus

Recommended Books:

1. Strength of Materials: S. Ramamrutham, Dhanpatrai Publishers.
2. Strength of Materials: R. K. Rajput, S. Chand Publications.
3. Mechanics of Materials: Vol-I: S. B. Junnarkar and H. J. Shah, Charotar Publications.
4. Strength of Materials: Subramanian, Oxford University Press
5. Strength of Materials: S. S. Rattan, Tata Mc-Graw Hill, New Delhi
6. StrengthofMaterials(MechanicsofMaterials):R.S.LehriandA.S.Lehri,S.K.Kataria Publishers, New Delhi
7. Strength of Materials: Dr. V. L. Shah, Structures Publications, Pune

Reference Books:

8. Mechanics of Materials: James, M. and Barry J.; Cengage Learning.
9. Mechanics of Materials: Andrew Pytel and Jaan Kiusalaas, Cengage Learning.
10. Mechanics of Materials: Timoshenko and Gere, Tata McGrawHill, New Delhi.
11. Mechanics of Materials: James M .Gere, Books/Cole.
12. Strength of Materials: G. H. Ryder, Mc-Millan.
13. Mechanics of Materials: E. P. Popov, Prentice Hall India (PHI) Pvt. Ltd.
14. Mechanics of Materials: Pytel and Singer, Mc-GrawHill, NewDelhi.
15. Strength of Materials: William A. Nash and Nillanjan Mallick, Mc Graw Hill BookCo.(Schaum's Outline Series)

Semester- III

Subject Code	Subject Name	Credits
CIL 302	Modern Surveying (Lab)	1.5

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	03	-	-	1.5	-	1.5

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test-I	Test-II	Average						
-	-	-	-	-	50	-	25	75

Objectives

The students will be able to:

1. Study various surveying instruments, their least counts, various parts and suitable uses.
2. Apply methods of measurements in the field.
3. Demonstrate skills for collecting, recording and analyzing the field data.
4. Learn advanced instruments/techniques.
5. Acquire first hand practical experience by receiving field exposure to collect site specific data.
6. Exhibit setting out techniques.

Outcomes

At the end of the course, learner will be able to:

1) Operate and use the surveying instruments.
2) Measure linear and angular dimensions in horizontal and vertical planes.
3) Collect record and analyze the field data systematically.
4) Compare advanced instruments/ techniques with the conventional ones.
5) Prepare the drawings from the collected data in the form of plans, sections and contours.
6) Set out curves and foundation plans.

List of practical's and projects:

Performance of minimum four experiments out of list of 06 experiments and all the projects are mandatory.

Module	Detailed Contents	Lab Sessions /Hr
1	Chain and compass surveying.	03 hrs
2	Simple and compound leveling practices	03 hrs
3	Measurement of horizontal angles and vertical angles using a Theodolite.	03 hrs
4	Measurement of distances, bearings and area using total station.	03 hrs
5	Find constants, heights and distances using Tacheometery.	03 hrs
6	Determination of co – ordinates and lengths of a profile using GPS.	03 hrs

Projects:	
A survey camp of three days is to be arranged to execute the following projects for undergoingthe students through practical instructions in civil engineer's career with the actual field exposure at an ideal site location.	
1	**Project I:** Road project using Auto level for a minimum length of 500 m including fixing of alignment, profile leveling, cross-sectioning at 20m interval, plotting of 'L' section and 'C' section. (Two full imperial sheets, the first sheet with key plan and ' L' section and the second sheet covering any three typical Cross-sections)
2	**Project II:** Block Contouring project using Auto level for minimum 60 m × 60 m Area and generating contours by MS Excel. (Take contour interval as 0.2 meter)
3	**Project III:** Tachometric contouring project on a hilly area with at least two instrument stations about 60 m to 100 m apart and generating contours by taking Contour intervals as 1 meter.

Assessment:

Teamwork - Including above practical work, projects and assignments, distribution of marks for Term Work shall be as follows:

Practical Work : 15 marks
Assignments : 05 marks
Attendance : 05 marks

Projects-

Field work	:	15marks
Office work (Drawings)	:	10marks
Total	**:**	**50marks**

End Semester Practical/ Oral Examination

Practical Examination	:	10 Marks
Oral Examination	:	15 Marks.

- **Oral examination will be conducted after conduction of practical examination & itwill be based on term work & Practical examination.**

Reference Books:

1. Surveying and Levelling : R. Agor, Vol-I, 11th Edition, Khanna Publishers (ISBN 8174092358)
2. Surveying and Leveling: Kanetkar and Kulkarni,Vol-I, 24th Edition, Pune Vidyarthi Griha, Pune. (ISBN 8185825114)
3. Surveying and Levelling : Dr. B.C. Punmia, Vol.-I, 16th Edition, Vol -II 4th Edition, Laxmi Publications (ISBN9788170088530)
4. Surveying and Levelling: N N Basak, 2nd Edition, Tata McGraw Hill, New Delhi. (ISBN 9789332901537)
5. Surveying: Vol-I: Dr K.R. Arora, Standard Book House.
6. Surveying and Levelling (2nd Edition): R. Subramanian; Oxford Higher Education.
7. Surveying and Levelling (Vol.-I): S.K. Duggal, Tata Mc-Graw Hill
8. Global Positioning System: Signals, Measurements, and Performance, Pratap Misra (2nd Ed.), 2006.
9. Imaging Radar for Resource Survey: Remote Sensing Applications: W. Travelt, Chapman and Hall.
10. A Remote Sensing Perspective: Introductory Digital Image Processing: John, R. Jensen, Prentice Hall.
11. Remote sensing and Image interpretation, T.M Lilles, R.W Kiefer and J.W Chipman,5th edition, John Wiley and Sons India

Semester- III

Subject Code	Subject Name	Credits
CIL 303	Hydraulics (Lab)	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	02	-	-	01	-	01

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem Exam	Duration of End Sem Exam	TW	PR	OR	
Test-I	Test-II	Average						
-	-	-	-	-	25	-	25	50

Objectives

1. To acquire basic of Archimedes principal.
2. To illustrate Bernoulli's Equations from Experiment.
3. To understand the concept of how to find major and minor friction losses through differentpipes, bend, elbow, sudden contraction, enlargement.
4. To study the performance and efficiencies of various types of Turbines.
5. To study the performance of Centrifugal pump.
6. To analyze the discharge through Venturimeter, orifice meter, mouthpiece, rectangular, notches, triangular notch.

List of Experiments (Any Four)

Module	Detailed Contents	Lab Sessions/Hr
1	Verification of Archimedes principle	**2**
2	Verification of Bernoulli's Equations experimentally.	**2**
3	Determination of Major and Minor Friction losses through different pipes, bends, elbow, sudden enlargement, contraction.	**2**
4	Performance of Pelton wheel Turbine, Kaplan, and Francis with – half or full gate opening.	**2**
5	Performance of Centrifugal pumps.	**2**
6	Verification of Pascal's Law.	**2**
7	Determination of coefficient of discharge of Venturimeter, Orifice meter, Nozzle meter, of mouthpiece.	**2**
8	Determination of coefficient of discharge of Notches (Rectangular and Triangular notch).	**2**
9	Determination of coefficient of discharge of weirs (Broad Crested weir and Ogee weir).	**2**

Contribution to Outcome

Learner will be able to…

1. Understand the Archimedes principal.
2. Explain Bernoulli's experiment.
3. Analyze the major and minor friction losses.
4. Find out efficiencies of Different turbines.
5. Analyze the coefficient of discharge through Venturimeter, orifice meter, mouthpiece, rectangular notch, triangular notch.
6. Study the performance of centrifugal pump.

Assessment

Term Work Including

Practical work- :10 Marks

Assignments- : 10 Marks

Attendance : 05 Marks

End Semester Oral Examination

Oral examination will be based on the entire syllabus.

Recommended Books:

1. Hydraulics and Fluid mechanics: Dr. P.M. Modi and Dr. S.M. Seth, Standard Book House, Delhi
2. Theory and Application of Fluid Mechanics: K. Subramanian, Tata McGraw hill publishing Company, New Delhi.
3. Fluid Mechanics: Dr. A.K Jain, Khanna Publishers.
4. Fluid Mechanics and Hydraulics: Dr. S.K. Ukarande, Ane Books Pvt.Ltd. (Revised Edition 2012), ISBN 97893 8116 2538
5. Fluid Mechanics and fluid pressure engineering: Dr. D.S. Kumar, F.K. Kataria and sons
6. Fluid Mechanics: R.K. Bansal Laxmi Publications (P) Ltd.
7. Fluid Mechanics I & II: Dr. Atulya Patil, Jamanalal Publication.

Reference Books:

1. Fluid Mechanics: Frank M. White, Tata McGraw Hill International Edition.
2. Fluid Mechanics: Streeter White Bedford, Tata McGraw International Edition.
3. Fluid Mechanics with Engineering Applications: R.L. Daugherty, J.B. Fanzine, E.J.Fennimore, Tata McGraw Hill, New Delhi.
4. Hydraulics: James F. Cruise, Vijay P. Singh and Mohsen M. Sherif, CENGAGE Learning India (Pvt.) Ltd.
5. Introduction to Fluid Mechanics: Edward J. Shaugh nessy, Jr, Ira M. Katz, James P.Schaffer. Oxford Higher Education.

Semester- III

Subject Code	Subject Name	Credits
CIL 304	Skill Based Lab Course – I	1.5

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	03	-	-	1.5	-	1.5

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem Exam	Durationof End Sem Exam	TW	PR	OR	
Test-I	Test-II	Average						
-	-	-	-	-	50	-	-	50

Objectives

1. To enable the learners efficiently draft and label buildings components use the concepts of 2D and 3D drawing and detailing.
2. To introduce the concepts of object-based modelling in 3-D environment to learners.
3. To enable the learners to work on drawing and drafting on CAD software so that they can conveniently understand and design civil engineering components through the software.
4. To understand Creating families and basic models on BIM.
5. To learn creating architectural plan on BIM of a G+1 bungalow.
6. To learn create demonstration of a walkthrough on BIM for clients and presenting it.

List of Experiments (Minimum Six)		
Module	**Detailed Content**	**Lab Session / Hr.**
1	Basic introduction to compatibilities, utilities and attributes of peculiar drafting softwares w.r.t their various commands, features, capabilities and functions.	2
2	Line plan of a residential structure using a CADD tool	3

3	Developed plan of a residential structure (minimum G+4) using a CADD tool	3
4	Developed plan of a public building using a CADD tool	3
5	Basic introduction to compatibilities, utilities and attributes of peculiar building information modelling (BIM) softwares w.r.t their various commands, features, capabilities and functions	2
6	Creating families and basic models on BIM	2
7	Creating architectural plan on BIM of a G+1 bungalow	3
8	Demonstrating a walkthrough on BIM for clients and presenting it	2

Contribution to Outcome

At the end of the course, learner will be able:

1. Transfer the plan from a drawing sheet to a 2-D drafting software
2. Visualize the various elements in the software like points, lines, polygons, etc. as objects of the real world and relate it with civil engineering components.
3. Apply civil engineering concepts to draft efficient civil engineering plans in accordance to various building bye laws and forms.
4. Conceptualize the space, logistic and statutory constraints in the real world to draw an efficient plan so that optimization is achieved
5. Attach and retrieve information pertaining to various civil engineering components through 3-D modelling software
6. Demonstrate a virtual walkthrough of buildings.

Assessment:

Term Work: Including Laboratory Work comprising of minimum 6 software generated reports/sheets/program outputs with one walkthrough presentation on BIM, distribution of marks for Term Work shall be as follows:

Laboratory Work	:	30 Marks (comprising of minimum 6 software generated sheets)
Presentation	:	10 Marks (3D walk through of the building)
Attendance	:	10 Marks

Reference Books:

1. Software manuals
2. Refereed Journal papers on Software applications

Semester- III

Subject Code	Subject Name	Credits
CIM 301	Mini Project -1 A	1

Contact Hours			Credits Assigned			
Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
-	02	-	-	1	-	1

Theory					Term Work/Practical/Oral			Total
Internal Assessment			End Sem. Exam	Duration of End Sem. Exam	TW	PR	OR	
Test- I	Test- II	Average						
-	-	-	-	-	25	-	25	50

Rationale

From primitive habitats of early years to modern infrastructure, the civil engineering industry's growth has been need based and society centric. Civil and infrastructure engineers deal with many challenges on daily basis that most people do not have any idea. Mumbai University proposed Mini projects in the syllabus so that the budding civil engineers can connect with the world outside their textbooks and have the idea of future course.

The Mini project should actually provide solution to a typical problem after a brainstorming and in a stipulated period. The competitions ahead will give students the experience of the civil engineering industry's real-world problems and make students brainstorm ideas, learn, and explore the civil engineering industry.

Objectives

1. To recognize societal problems and convert them into a problem statement by understanding of facts and ideas in a group activity. (BTL-2)
2. To deal with new problems and situations by applying acquired knowledge, facts, techniques and rules in a different way. (BTL-3)
3. To examine and break information into parts, by analyzing motives or causes. (BTL-4)
4. To learn evaluating information, validity of ideas and work based on a set of criteria.(BTL-5)
5. To create solutions by compiling information together in a novel way. (BTL-6)
6. To design model by combining elements in a new pattern or proposing new solutions. (BTL-6)

Contribution to Outcome

Learner will be able to…

1. **Identify** problems based on societal/research needs and formulate a solution strategy.
2. **Apply** fundamentals to develop solutions to solve societal problems in a group.
3. **Analyze** the specific need, formulate the problem and deduce the interdisciplinary approaches, software based solutions and computer applications.
4. Develop systematic flow chart, **evaluate** inter disciplinary practices, devices, available software, estimate and recommend possible solutions.
5. Draw the proper inferences from available results through theoretical/experimental/simulations and **assemble** physical systems.
6. **Create** devises or design a working model for a particular application.

Guidelines for Mini Project

- Students shall form a group of 3 to 4 students, while forming a group shall not be allowed less than three or more than four students, as it is a group activity.
- Students should do survey and identify needs, which shall be converted into problem statement for mini project in consultation with faculty supervisor/head of department/internal committee of faculties.
- Students hall submit implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of mini project.
- A log book to be prepared by each group, wherein group can record weekly work progress, guide/supervisor can verify and record notes/comments.
- Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.
- Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.
- Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
- The solution to be validated with proper justification and report to be compiled in standard format of University of Mumbai.
- With the focus on the self-learning, innovation, addressing societal problems and entrepreneurship quality development within the students through the Mini Projects, it is preferable that a single project of appropriate level and quality to be carried out in two semesters by all the groups of the students. i.e. Mini Project 1 in semester III and IV. Similarly, Mini Project 2 in semesters V and VI.
- However, based on the individual students or group capability, with the mentor's recommendations, if the proposed Mini Project adhering to the qualitative aspects mentioned above gets completed in odd semester, then that group can be allowed to work on the extension of the Mini Project with suitable improvements/modifications or a completely new project idea in even semester. This policy can be adopted on case by case basis.

Guidelines for Assessment of Mini Project:

Term Work

- The review/ progress monitoring committee shall be constituted by head of departments ofeach institute. The progress of mini project to be evaluated on continuous basis, minimum two reviews in each semester.
- In continuous assessment focus shall also be on each individual student, assessment based on individual's contribution in group activity, their understanding and response to questions.

Distribution of Term work marks for both semesters shall be as below;

- Marks awarded by guide/supervisor based on log book : 10
- Marks awarded by review committee : 10
- Quality of Project report : 05

Review/progress monitoring committee may consider following points for assessment based on either one year or half year project as mentioned in general guidelines.

One-year project:

- In first semester entire theoretical solution shall be ready, including components/system selection and cost analysis. Two reviews will be conducted based on presentation given bystudents group.
- First shall be for finalization of problem
- Second shall be on finalization of proposed solution of problem.
- In second semester expected work shall be procurement of components /systems, buildingof working prototype, testing and validation of results based on work completed in an earlier semester.
- First review is based on readiness of building working prototype to be conducted.
- Second review shall be based on poster presentation cum demonstration of working model in last month of the said semester.

Half-year project:

- In this case in one semester students' group shall complete project in all aspects including,
  - Identification of need/problem
  - Proposed final solution
  - Procurement of components/systems
  - Building prototype and testing

- Two reviews will be conducted for continuous assessment,
  - First shall be for finalization of problem and proposed solution
  - Second shall be for implementation and testing of solution.

Assessment criteria of Mini Project.

Mini Project shall be assessed based on following criteria;

1. Quality of survey/ need identification
2. Clarity of Problem definition based on need.
3. Innovativeness in solutions
4. Feasibility of proposed problem solutions and selection of best solution
5. Cost effectiveness
6. Societal impact
7. Innovativeness
8. Cost effectiveness and Societal impact
9. Full functioning of working model as per stated requirements
10. Effective use of skill sets
11. Effective use of standard engineering norms
12. Contribution of an individual's as member or leader
13. Clarity in written and oral communication

- In **one year, project**, first semester evaluation may be based on first six criteria's and remaining may be used for second semester evaluation of performance of students in mini project.
- In case of **half year project** all criteria's in generic may be considered for evaluation of performance of students in mini project.

Guidelines for Assessment of Mini Project Practical/Oral Examination:

- Report should be prepared as per the guidelines issued by the University of Mumbai.
- Mini Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and External Examiners preferably from industry or research organisations having experience of more than five years approved by head of Institution.
- Students shall be motivated to publish a paper based on the work in Conferences/students competitions.

Mini Project shall be assessed based on following points;

1. Quality of problem and Clarity
2. Innovativeness in solutions
3. Cost effectiveness and Societal impact
4. Full functioning of working model as per stated requirements
5. Effective use of skill sets
6. Effective use of standard engineering norms
7. Contribution of an individual's as member or leader
8. Clarity in written and oral communication

NOTE-

1: For Detailed Course Schemes, Course Objectives, Internal & External Assessment process, End Semester Examination, Recommended & reference Books please refer MU syllabus of Second year (C-Scheme / R-19) Civil & Infrastructure Engineering.

2: Theory and Practical Examination will be strictly based on above compressed syllabus.