MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

B.Tech –Civil Engineering | Academic Year: 2018-19

PROGRAM OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

Program Articulation Matrix

	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
SEM I	PY1101	3	3	3	3	3	2	3	3	3	3	3	-	-	-	-	-
	MA1101	3	3	3	2	1	-	1	-	-	3	-	1	-	-	-	-
	ES1101	3	3	1	2	3	3	3	3	3	-	1	3	-	-	-	-
	EC1101	3	3	3	2	2	1	1	-	-	-	-	2	-	-	-	-
	ES1102	3	3	3	3	3	2	2	1	2	3	1	1	-	-	-	-
	CY1101	2	1	1	1	1	1	1	1	-	1	-	1	-	-	-	-
SEM II	MA1201	3	3	3	2	1	-	1	-	-	1	-	1	-	-	-	-
	EE1101	3	2	1	-	-	1	1	-	-	-	-	3	-	-	-	-
	CS1101	3	3	3	-	1	-	1	1	1	2	2	2	-	-	-	-
	ES1103	3	3	3	2	-	2	2	-	-	-	-	-	-	-	-	-
	HS1102	2	2	2	-	2	2	-	-	-	-	-	3	-	-	-	-
	EN1111	2	3	1	-	-	-	2	1	3	3	2	3	-	-	-	-
SEM III	MA1308	3	3	3	3	3	2	2	1	2	3	1	1	2	2	2	3
	CV1301	3	3	3	2	2	3	2	3	-	2	1	3	2	2	2	2
	CV1302	3	3	3	3	3	2	2	1	2	3	1	1	2	2	2	3
	CV1303	3	3	1	3	3	1	-	3	3	1	2	2	3	3	2	2
	CV1304	3	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3
	CV1330	3	3	1	3	3	1	-	3	3	1	2	2	3	3	2	2
	CV1331	3	3	3	-	3	3	-	-	3	-	-	3	3	3	3	3
	BB1101	-	-	-	-	-	1	3	2	1	2	1	2	-	-	3	-
SEM IV	CV1401	3	3	3	3	2	-	2	1	-	1	2	3	2	2	1	1
	CV1402	3	3	3	3	3	3	-	1	2	1	1	2	3	2	3	3
	CV1403	3	2	-	-	3	-	-	3	-	2	3	-	1	3	3	3
	CV1430	3	-	-	-	3	3	-	-	3	2	-	3	3	3	2	2

	CV1431	2	2	3	2	2	-	-	-	3	-	-	3	1	3	3	1
	CV1432	3	3	3	-	3	3	-	-	3	-	-	3	3	3	3	3
	CV1433	3	3	2	1	1	2	2	1	1	1	1	3	3	2	1	2
SEM V	CV1501	3	3	3	3	3	2	2	1	2	3	1	1	2	2	2	3
	CV1504	3	3	3	3	3	2	2	1	2	3	1	1	2	2	2	3
	CV1505	3	3	3	3	3	2	2	1	2	3	1	1	2	2	2	3
	CV1560	3	2	2	3	3	1	2	1	1	1	-	1	2	2	3	1
	CV1564	3	3	3	3	-	3	-	-	3	2	-	3	3	3	3	3
	CV1530	2	2	2	2	1	-	-	1	2	2	-	2	1	3	2	1
	CV1532	2	2	3	2	2	-	-	-	3	-	-	3	1	3	3	3
SEM VI	CV1601	3	3	3	3	1	-	-	-	1	1	-	2	2	3	-	1
	CV1603	2	3	3	3	3	2	2	1	1	2	1	2	2	3	2	1
	CV1604	3	2	2	2	2	2	-	2	3	-	2	-	2	2	3	1
	CV1660	3	2	3	3	3	3	3	-	3	2	3	3	-	3	2	2
	CV1690	3	-	-	-	1	-	1	-	-	-	-	3	-	-	-	2
	CV1630	3	1	3	2	3	3	-	-	3	2	2	3	3	3	2	2
	CV1631	3	2	2	1	1	1	-	1	1	-	-	2	3	3	2	2
SEM VII	CV1701	3	2	-	-	-	-	-	3	-	2	3	-	1	3	3	2
	CV1702	3	2	2	2	2	2	-	2	3	1	3	-	3	3	3	3
	CV1763	-	-	2	3	-	3	-	-	-	-	3	1	2	2	3	2
	CV1766	3	3	3	2	3	3	3	2	2	1	1	1	3	3	1	3
	CV1767	3	3	3	2	2	1	1	1	1	-	1	2	3	3	1	2

MANIPAL UNIVERSITY JAIPUR
School of Basic Sciences

Department of Physics
Course Hand-out

Engineering Physics | PY 1101 | 5 Credits | 3 1 1 5

Session: Jul- Nov, 2018| Faculty: Dr. Saikat | Class: B.Tech. I Sem.

A. Introduction: The mission of the Engineering Physics course is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. The course work will develop sufficient depth in physics skills to produce engineers who can relate fundamental physics to practical engineering problems, and will possess the versatility to address new problems in our rapidly changing technological base. The present course is meant to provide a more thorough grounding in applied physics for a selected specialty such as optics, quantum physics, atomic & molecular physics and solid-state physics. The discipline is also meant for cross-functionality and bridges the gap between theoretical science and practical engineering. It is notable the term "engineering physics" is also called as "technical physics" in several universities and colleges.

B. Course Objectives: At the end of the course, students will be able to

[1101.1] understand the wide range of diversity in science and technology with the help of knowledge of basic Physics along with practical approach of Engineering Physics.
[1101.2] explain various processes involved in understanding the nature of light.
[1101.3] identify the problems and applications of Quantum mechanics.
[1101.4] impart the knowledge of empirical laws based on Solid state Physics and Atomic and Molecular Physics.
[1101.5] achieve perfectness in experimental skills and the study of practical applications in Physics.
[1101.6] develop skills to impart practical knowledge in real time solution.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Handwritten Note Book)	15
	Sessional Exam II (Open Handwritten Note Book)	15
	In class Quizzes (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Open Handwritten Note Book)	40
Lab Evaluation	Regular Lab Performance & viva-voce, laboratory end term exam	20
	Total	100
Attendance (Formative)	A minimum of 75% attendance separately for each component (Theory lectures and Practical) is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

OPTICS: Two source interference, Double slit interference, Coherence, Intensity in Double slit interference, interference from thin films, Air-wedge, Newton`s rings, Michelson`s interferometer, Diffraction and wave theory of light, Single-slit diffraction, Intensity in single-slit diffraction (using Phasor Method), Diffraction at a circular aperture, Double-slit interference and diffraction combined-Intensity in double-slit diffraction (qualitative approach), Diffraction of light through multiples slits, Diffraction gratings, Dispersion and resolving power of gratings, Polarization of electromagnetic waves, Polarizing sheets, Polarization by reflection, Double refraction.

QUANTUM PHYSICS: Black body radiation and Planck`s hypothesis, Stefan`s Law, Wein`s displacement law, Photoelectric effect, Compton effect, Photons and electromagnetic waves, Wave properties of particles, de-Broglie hypothesis, Davisson-Germer Experiment, Quantum particle (wave packet, phase speed, ground speed), the uncertainty principle.

QUANTUM MECHANICS : An interpretation of quantum mechanics, Wave function and its significance, Schrodinger equation, particle in a box, Particle in a well of finite height (qualitative), Tunnelling through a potential barrier and its applications, The simple harmonic oscillator(qualitative).

ATOMIC PHYSICS & MOLECULAR PHYSICS : Atomic spectra of gases, Energy states and spectra of molecules(rotational and vibrational energy levels), X-rays-Types, Moseley law, Spontaneous and stimulated transitions, He-Ne and Ruby laser, Application of lasers.

SOLID STATE PHYSICS: Band theory of solids, Electrical conduction in metals, Insulators, and Semiconductors, Superconductivity- Type I and type II Super conductors, Meisner effect, BCS Theory (Introductory) and applications of Superconductivity.

E. TEXT BOOKS

1. Halliday, Resnick, Krane, PHYSICS, Volume 2, 5th edition, John Wiley & Sons, Inc, 2011 *(For Optics)*
2. Beiser & Mahajan, Modern Physics, Mc Graw Hill, 6th edition., 2009 *(For Quantum Physics, Quantum Mechanics, Atomic Physics, Solid State Physics)*

F. REFERENCE BOOKS

Serway & Jewett, PHYSICS for Scientists and Engineers with Modern Physics; Volume 2,6th edition,

G. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Discussion of Lecture Plan	To acquaint and clear teachers expectations and understand student expectations	Lecture	**1101.1**	NA
2	Introduction to OPTICS	To make the student understand the difference between physical and geometrical optics. Recall elementary idea of transverse and longitudinal waves. Develop mathematical representation of waves.	Flipped Classroom	**1101.1 & 1101.2**	In Class Quiz (Not Accounted)
3	Interference of light, Young's double slit interference, coherence	Understanding of the concept of coherent waves and interference	Lecture	**1101.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
4	Intensity in double slit interference using Phasor method	Derivation of the formula for intensity distribution in double slit interference	Lecture	**1101.2**	Class Quiz – I Home Assignment -I Mid Term I End Term
5	Interference in thin film, antireflection coatings	Understand the concept of thin-film interference	Lecture	**1101.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
6	TUTORIAL:1		Activity (Think Pair Share)	**1101.2**	
7	Interference in wedge shaped air film	Understand the concept of interference in wedge shaped films and introduction to Newton's ring	Lecture	**1101.2**	Class Quiz – I Home Assignment - I Mid Term I End Term

8	Newton's rings – theory and experiment	Describe the Newton's ring experiment and develop the theory of Newton's ring	Lecture	**1101.2**	Class Quiz – 1 Home Assignment-1 Mid Term I End Term
9	**TUTORIAL: 2**		Activity (Think Pair Share)	**1101.2**	
10-11	Michelson interferometer – construction & theory (Qualitative approach only), Applications of Michelson interferometer (determination of wavelength)	Description of Michelson interferometer and derivation of the formula for determination of wavelength using it.	Lecture	**1101.2**	Class Quiz – 1 Home Assignment -1 Mid Term I End Term
12	**TUTORIAL: 3**		Activity (Think Pair Share)	**1101.2**	
13-14	Diffraction and wave theory of light, Fraunhoffer diffraction at single slit – theory and intensity distribution	Introduction to diffraction and understand the difference between Fraunhoffer and Fresnel diffraction	Lecture, Activity	**1101.2**	Class Quiz – 2 Home Assignment- 2 Mid Term I End Term
15-16	Analysis by Phasor method, Intensity distribution curve, Diffraction at a circular aperture	Develop the theory and formula for single slit diffraction	Lecture	**1101.2**	Class Quiz – 2 Home Assignment - 2 Mid Term I End Term
17	**TUTORIAL:4**		Activity (Think Pair Share)	**1101.2**	
18	Fraunhoffer diffraction at double slit – theory (Qualitative approach only) and intensity distribution	Qualitatively develop the formula for intensity distribution in double slit diffraction	Lecture	**1101.2**	Class Quiz – 2 Home Assignment - 2 Mid Term I End Term
19	Fraunhoffer diffraction at multiple slit – theory and intensity distribution, Diffraction grating	Understand the multiple slit diffraction pattern and diffraction grating	Lecture	**1101.2**	Class Quiz – 3 Home Assignment- 2 Mid Term I End Term
20	**TUTORIAL:6**		Activity (Think Pair Share)	**1101.2**	
21	Rayleigh's criteria of resolution, Dispersion and resolving power of grating	Understand the Raleigh's criteria for resolution and derive the expression for dispersive and resolving power	Lecture	**1101.2**	Class Quiz – 3 Home Assignment-2 Mid Term I End Term
22	**TUTORIAL:7**		Activity (Think Pair Share)	**1101.2**	
23-24	Polarization of EM Waves, Polarizing sheets, Polarization by reflection, Double refraction, Malus law & Brewsters law	Understand the phenomena of polarisation and different approaches to polarise EM waves	Lecture	**1101.2**	Class Quiz – 3 Home Assignment - 3 Mid Term I End Term

25	**TUTORIALS: 8**		Activity (Think Pair Share)	**1101.2**	
26-27	Black body radiation , Wein's law, Stefan-Boltzmann law, Raleigh-Jeans Law, UV Catastrophe, Planck's hypothesis and Planck's law of black body radiation	Understand the laws of Black Body radiation and introduction to Planck's hypothesis	Flipped Class, Lecture	**1101.1 & 1101.3**	Class Quiz – 4 Home Assignment - 4 Mid Term II End Term
28-29	Photoelectric effect, Experimental observations of Photoelectric effect, Compton effect (Qualitative approach)	Describe the theory of Photoelectric effect and Compton effect	Lecture	**1101.1 & 1101.3**	Class Quiz – 4 Home Assignment - 4 Mid Term II End Term
30	**TUTORIAL:9**		Activity (Think Pair Share)	**1101.3**	
31	Photons and electromagnetic waves, de-Broglie hypothesis of matter wave, Davisson-Germer Experiment	Understand the concept of de-Broglie hypothesis and describe the Davission-Germer Experiment	Lecture	**1101.1 & 1101.3**	Class Quiz – 5 Home Assignment - 4 Mid Term II End Term
32-33	Quantum particle, Concept of wave packet. Group and phase velocity, Relation between V_g & V_p in dispersive medium, Uncertainty Principle (Statement and expression only) and its Physical significance	Understand the Group Velocity and Phase Velocity and the concept of Uncertainty Principle	Flipped Classroom, Lecture	**1101.3**	Class Quiz – 5 Home Assignment - 5 Mid Term II End Term
34	**TUTORIAL: 10**		Activity (Think Pair Share)	**1101.3**	
35	An Interpretation of Quantum mechanics, Wave function and its physical significance, SchrŐdinger wave equation	Introduction to wave function and Schrodinger wave equation	Lecture	**1101.3**	Class Quiz – 5 Home Assignment - 5 Mid Term II End Term
36	Particle in a box of infinite potential height	Derive the wave-function and energy of a particle confined in a one dimensional box	Lecture	**1101.3**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
37	**TUTORIAL: 11**		Activity (Think Pair Share)	**1101.3**	
38-39	Particle in a well of finite height (qualitative), Tunnelling through a potential barrier (	Qualitatively describe the phenomena of particle in a finite well and the phenomena of tunnelling	Lecture	**1101.3**	Class Quiz – 6 Home Assignment -5 Mid Term II End Term

	qualitative) and its applications				
40	Quantum mechanical simple harmonic oscillator (Qualitative)	Qualitative discussion of the wave function and energy of a harmonic oscillator	Lecture	**1101.3**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
41	**TUTORIAL: 12**		Activity (Think Pair Share)	**1101.3**	
42-43	Bohr's Theory, Atomic Spectra of gases, Continuous and characteristic X-rays, Duane – Hunt relation, Moseley's law	Recall Bohr's theory and atomic spectra. Understand the continuous and characteristic X-rays and derive the related formula.	Flipped Classroom, Lecture	**1101.1 & 1101.4**	Class Quiz (Not Accounted) Home Assignment - 6 End Term
44-45	Energy states and spectra of molecules (Rotational and Vibrational spectra)	Qualitative discussion of Rotational and Vibrational spectra and the related formulas	Lecture	**1101.4**	Class Quiz – 7 Home Assignment - 6 End Term
46	**TUTORIAL: 13**		Activity (Think Pair Share)	**1101.4**	
47	Lasers-Spontaneous and stimulated transitions, Population inversion and metastable state,	Understand the lasers and the related optical phenomena.	Lecture	**1101.4**	Class Quiz – 7 End Term
48-49	Construction and working of Ruby laser , Construction and working of He-Ne laser, Energy level diagram of He-Ne laser, Application of Laser	Description of Ruby laser and He-Ne laser and understand their working	Flipped Classroom, Lecture	**1101.4**	Class Quiz – 7 End Term
50	**TUTORIAL: 14**		Activity (Think Pair Share)	**1101.4**	
51	Band Theory of solids, Electrical conduction in Metals, Insulators, and Semiconductors	Understand qualitatively the band theory of solids	Lecture	**1101.4**	Class Quiz – 8 End Term
52-53	Superconductivity: Type-I and Type- II Superconductivity, Meisner effect	Introduction to super conductivity and superconductors and the related phenomena	Lecture	**1101.4**	Class Quiz – 8 End Term
54	**TUTORIAL: 15**		Activity (Think Pair Share)	**1101.4**	
55	BCS Theory (Introductory) and Applications of superconductivity	Qualitatively understand the BCS theory and their applications	Lecture	**1101.4**	Class Quiz – 8 End Term
56	**TUTORIAL: 16**		Activity (Think Pair Share)	**1101.4**	

LAB SESSIONS	Lab sessions based on different aspects of physics	Experiment and test different aspects of physics related to the theory taught in the class	Lab Sessions	**1101.5 & 1101.6**	Experimental results and viva-voce of 14 lab sessions Laboratory End Term Exam

H. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
PY 1101.1	understand the wide range of diversity in science and technology with the help of knowledge of basic Physics along with practical approach of Engineering Physics	3	1		2		2		3								
PY 1101.2	explain various processes involved in understanding the nature of light		3	3		2		2					1				
PY 1101.3	identify the problems and applications of Quantum mechanics	3					1	1				3	2				
PY 1101.4	impart the knowledge of empirical laws based on Solid state Physics and Atomic and Molecular Physics	1			3	2				1			1				
PY 1101.5	achieve perfectness in experimental skills and the study of practical applications in Physics			2		3	2		2	3			3				
PY 1101.6	develop skills to impart practical knowledge in real time solution	2			2		1	3			3	1					
	Max correlation -->	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

Faculty of Engineering

B.Tech. First Year (All branches)

DEPARTMENT OF MATHEMATICS AND STATISTICS

Course Hand-out

Engineering Mathematics-I| MA1101 | 4 Credits | 3 1 0 4

Session: July – Dec., 2018 | Faculty: Dr. Mohd. Rizwanullah & Dr. Reema Jain | Class: B.Tech. First Year

A. Introduction: An engineering student needs to have some basic mathematical tools and techniques which emphasize the development of rigorous logical thinking and analytical skills. Based on this, the course aims at giving adequate exposure to the theory and applications. The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.

B. Course Objectives: At the end of the course, students will be able to

[MA1101.1] Solve the problem on Radius of curvature, Circle and chord of curvature, Asymptotes, curve tracing for Cartesian and polar curves.

[MA1101.2] Demonstrate the understanding of the derivatives of functions of several variables and it will enhance the problem solving skills.

[MA1101.3] Optimize the functions of several variables using Hessian method and Lagrangian method and further will improve the logical skills hence Employability.

[MA1101.4] Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra

[MA1101.5] Solve Eigen value problems, Applications of integral calculus: area and length of curves and volume of solid of revolution of simple curves.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment ÷ Plan

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Differential Calculus: Radius of curvature, Circle and chord of curvature, Asymptotes, curve tracing for Cartesian and polar curves. Taylor's theorem for a function of one variable. Taylor's and Maclaurin's expansion of functions. **Partial Differentiation**: Euler's theorem on homogeneous functions, total derivative, derivatives of composite and implicit functions, Taylor's theorem for a function of two variables, extreme values of a function of

two variables, Lagrange's method of undetermined multipliers, Errors and approximations. **Integral Calculus**: Reduction formulae. Applications of integral calculus: area and length of curves and volume of solid of revolution of simple curves. **Matrices**: Elementary transformations, Inverse and rank of a matrix by elementary transformation, consistency and solution of system of simultaneous equations, eigenvalues, eigenvectors, Caley-Hamilton theorem, diagonalization of a matrix

F. Text Books

T1. S. Pal & S. C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
T2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006.
T3. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill, 2014.

G. Reference Books

R1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley India Edition, 2006.

R2. B. Ram, "Engineering Mathematics", Vol. I & II, Pearson, 2012.

R3. S. Narayan, "Differential Calculus", Shyam Lal Charitable Trust, Delhi, 2002.
R4. S. Narayan, "Integral Calculus", S. Chand & Co., Delhi, 2005

H. Lecture Plan:

Lecture No.	Description of the Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
	Curvature & Asymptotes:				
1	Introduction, Definition, Radius of curvature (Cartesian Coordinate)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
2	Radius of curvature (Parametric Coordinate)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
3	Radius of curvature (Polar Coordinate)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
4	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.1**	Quizzes, Two Sessional, End Term Examination
5	Circle of curvature	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
6	Chord of curvature	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
7	Asymptotes (Parallel)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination

8	Asymptotes (Inclined)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
9	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.1**	Quizzes, Two Sessional, End Term Examination
	Curve Tracing				
10	Procedure for tracing Cartesian curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
11	Problems based on above topic	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
12	Procedure for tracing polar curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
13	Problems based on above topic	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.1**	Quizzes, Two Sessional, End Term Examination
14	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.1**	Quizzes, Two Sessional, End Term Examination
15	Taylor's theorem for a function of one variable	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination

16	Taylor's and Maclaurin's expansion of functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
17	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.2**	Quizzes, Two Sessional, End Term Examination
	Partial Differentiation				
19	Introduction & problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
20	Euler's theorem on homogeneous functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
21	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.2**	Quizzes, Two Sessional, End Term Examination
22	Total derivative	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
23	Derivatives of composite and implicit functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
24	Change of variables	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
25	**Tutorial Class**	Identify, formulate, apply appropriate techniques,	Problem solving	**1101.2**	Quizzes, Two Sessional, End Term Examination

		professional ethics, Communicate effectively & life-long learning			
27	Taylor's theorem for a function of two variables	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
28	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.2**	Quizzes, Two Sessional, End Term Examination
29	Extreme values of a function of two variables	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.3**	Quizzes, Two Sessional, End Term Examination
30	Lagrange's method of undetermined multipliers	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.3**	Quizzes, Two Sessional, End Term Examination
31	Errors and approximations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.3**	Quizzes, Two Sessional, End Term Examination
32	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.3**	Quizzes, Two Sessional, End Term Examination
	Matrices:				
33	Matrices, elementary column and row transformations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
34	Inverse of a matrix by elementary transformations	Identify, formulate, apply appropriate techniques, professional ethics,	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination

		Communicate effectively & life-long learning			
35	Rank of a matrix by elementary transformations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
36	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.4**	Quizzes, Two Sessional, End Term Examination
37	Solution of systems of linear equations, consistency	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
39	Solution by Gauss elimination	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
40	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.4**	Quizzes, Two Sessional, End Term Examination
41	Cayley-Hamilton theorem, Eigenvalues	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.5**	Quizzes, Two Sessional, End Term Examination
42	Eigenvectors	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.5**	Quizzes, Two Sessional, End Term Examination
43	Diagonalization of a square matrix	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.5**	Quizzes, Two Sessional, End Term Examination

44	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.5**	Quizzes, Two Sessional, End Term Examination
	Integral Calculus:				
46	Reduction formulae	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
47	Area of simple curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
48	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.6**	Quizzes, Two Sessional, End Term Examination
49	Lengths of simple curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
51	Volume of revolution of simple curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
52	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.6**	Quizzes, Two Sessional, End Term Examination

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												~~CORRELATION WITH PROGRAM SPECIFIC OUTCOMES~~		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	~~PSO 1~~	~~PSO 2~~	~~PSO 3~~
MA1101.1	Solve the problem on Radius of curvature, Circle and chord of curvature, Asymptotes, curve tracing for Cartesian and polar curves.	3	2	3	1			1			1		1			
MA1101.2	Demonstrate the understanding of the derivatives of functions of several variables and it will enhance the problem solving skills.	3	2	1	2	1										
MA1101.3	Optimize the functions of several variables using Hessian method and Lagrangian method and further will improve the logical skills hence Employability.	3	3	2	2						3		1			
MA1101.4	Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra	3	2	2	2	1		1					1			
MA1101.5	Solve Eigen value problems, Applications of integral calculus: area and length of curves and volume of solid of revolution of simple curves	2	3	1	1	1							1			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Environmental Studies | ES 1101 | 3 Credits | 3 0 0 3

Session: July – Nov 2018 | Faculty: Dr. M. Prabhu Inbaraj | Class: B. Tech Semester I

Introduction: This course is offered to B. Tech. first year students to make them aware of the importance of our natural environment. The course offers insights into the basics of environment, its components, functions; impacts of natural and anthropogenic activities on environment; methods to tackle such environmental issues. Further, this course emphasises on the significance of life on earth and thus, the need for its protection. Overall, this course is aimed to sensitise students to realise links between the natural and man-made environment.

A. Course Outcomes: At the end of the course, students will be able to;

[1101.1]. Apply the fundamental knowledge of environment, ecology and ecosystem to save the environment for sustainable development.

[1101.2]. Apprehend environmental problems and its linkage to the health and safety of society; think and act with a sense of responsibility, committing to the professional ethics.

[1101.3]. Develop the skill of the technique / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.

[1101.4]. Realise the active involvement of oneself and society in designing the activities / processes with which the environment and ecosystem would be preserved, considering public health and safety.

[1101.5]. Explore the impacts of various man-made activities from an environmental context. Students can demonstrate the knowledge by participating in class debates and presentations on various topics of environmental concern with effective communication.

B. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

Introduction to Environmental Studies; Multidisciplinary Nature of Environmental Studies, Scope and importance, concept of sustainability and sustainable development; spheres of the earth; structure of atmosphere.

Ecosystems; concept, structure and function, energy flow in an ecosystem, food chain, food webs and ecological succession, Forest, Grassland, Desert and Aquatic (Ponds, Streams, Lakes, River, Oceans, Estuaries) ecosystem.

Natural Resources (Renewable & Non Renewable Resources); Land Resources and land use change, Land degradation, soil erosion and desertification; Deforestation; Causes and impacts. Water; Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources; Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs.

Biodiversity and Conservation; Genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, threats to biodiversity; Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity; *In-situ* and *ex-situ* conservation of biodiversity. Ecosystem and biodiversity services; Ecological, economic, social, ethical, aesthetic and Informational value.

Environmental Pollution; Environmental Pollution; type, causes, effects, and controls; Air, Water, Soil and Noise pollution, Nuclear hazards and human health risks, ill effects of fireworks, Solid waste management; control measures of urban and industrial waste, pollution case studies.

Environmental Policies and Practices; Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment laws; Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act; International agreements; Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Human Communities and the Environment; Human population growth; impact on environment, human health and welfare, Resettlement and rehabilitation of project affected persons; case studies, Disaster management; flood, earthquake, cyclone and landslides. Environmental movements; Chipko, Silent valley, Bishnois of Rajasthan, Environmental ethics; Role of Indian and other religions and cultures in environmental conservation, Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi), Environmental Impact Assessment (EIA).

Field Work and field visits.

E. TEXT BOOKS (number as T1, T2 etc)

1. Bharucha, E. (2013). Text book of Environmental Studies for undergraduate courses, Universities Press, Hyderabad, 2nd Edition
2. Carson, R. (2002). Silent Spring. Houghton Mifflin Harcourt.
3. De, A. K. and De, A. K. (2007). Environmental Studies, New Age International Publishers, New Delhi.
4. Gadgil, M. and Guha, R. (1993). This Fissured Land; An Ecological History of India. University of California, Press.
5. Groom, Martha J., Gary, K. Meffe and Carl Ronald Carroll (2006). Principles of Conservation Biology. Sunderland; Sinauer Associates.
6. Grumbine, R. Edward and Pandit, M. K. (2013).Threats from India's Himalaya dams. Science, 339; 36-37.
7. Rajagopalan, R. (2016). Environmental Studies; From Crisis to Cure, Oxford University Press.
8. Singh, J. S., Singh, S. P. and Gupta, S. R. (2014). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

F. REFERENCE BOOKS (number as R1, R2 etc)

1. Molles, M. C. (2015). Ecology: Concepts and Applications. McGraw Hill Higher Education, 7th Edition, 592 P.
2. Chiras, D. D. (2014). Natural Resource Conservation: Management for a Sustainable Future. Pearson India.

Lecture Plan:

LEC NO	TOPICS
1	**Multidisciplinary Nature of Environmental Studies:** Scope of environmental studies, a multidisciplinary view, Importance of environmental studies
2	**Ecosystems and Environment:** Spheres of the earth: atmosphere, lithosphere, hydrosphere, biosphere
3	**Structure of the atmosphere:** troposphere, stratosphere, mesosphere, thermosphere, exosphere
4	**Ecology**: structure and function of the ecosystem
5	**Bio-geochemical cycles:** Nitrogen, Carbon
6	**Bio-geochemical cycles:** Sulphur, Phosphorous
7	**Ecological succession**
8	**Natural resources (Renewable & Non Renewable Resources):** Water Resources
9	**Energy Resources**: Conventional and non-conventional
10	**Energy Resources:** Conservation and Management
11	Forest Resources
12	Land Resources
13	**Biodiversity and its Conservation:** Biodiversity: Importance of biodiversity
14	Threats to biodiversity
15	Factors affecting biodiversity
16	Conservation of biodiversity
17	**Environmental pollution and control** : **Air pollution**: sources of air pollution and classification of air pollutants
18	Primary and secondary air pollutants
19	**Fireworks:** Chemical used, toxic fall out and their persistent in soil and water, Its ill effects on air quality pertaining to gaseous and particulate matter, Health hazards prevention and Control
20	**Water pollution:** Sources of water pollution, water quality standards (physical, chemical and biological characteristics of water quality parameters)
21	Effects of water pollution and Water Borne Diseases and its control
22	Basic water treatment process (filtration, sedimentation and overview of treatment plant)
23	**Soil pollution:** sources, effects and control of soil pollution
24	**Noise pollution:** sources, effects and control of noise pollution
25	**Solid waste management:** sources, characteristics
26	**Solid waste management:** control measures of urban and industrial wastes
27	Hazardous Waste – Environmental problems and health risks
28	**Environmental impact assessment(EIA):** Methodology and importance
29	**Social Issues and Environment:** Environmental concerns: urbanization, industrialization, agricultural revolution and their impact on environment
30	**Global warming** and greenhouse effect.
31	**Acid rain:** Causes and effects
32	**Ozone depletion** & depletion of ozone hole over Antarctica.
33	Urban problems related to energy
34	Water conservation, rain water harvesting, watershed management
35	Resettlement and rehabilitation of people; its problems and concerns. Case Studies
36	Wasteland reclamation
37	Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.
38	**Human Population and the Environment:** Population growth, variation among nations, Population explosion – Family Welfare Programme.
39	Environment and human health, Women and Child Welfare, Role of Information Technology in Environment.
40	Concept of sustainability and sustainable development.
41	**Field Work:** Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Study of common plants, insects, birds and basic principles.
42	Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
43	Study of simple ecosystems-pond, river, Delhi Ridge, etc.

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
[1101.1].	Apply the fundamental knowledge of environment, ecology and ecosystem to save the environment for sustainable development.	3		1			1	2					3					
[1101.2].	Apprehend environmental problems and its linkage to the health and safety of society; think and act with a sense of responsibility, committing to the professional ethics.		3				3		3	2								
[1101.3].	Develop the skill of the technique / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.	3	1			3	2	3		1			3					
[1101.4].	Realise the active involvement of oneself and society in designing the activities / processes with which the environment and ecosystem would be preserved, considering public health and safety.			1	1					3								
[1101.5].	Explore the impacts of various man-made activities from an environmental context. Students can demonstrate the knowledge by participating in class debates and presentations on various topics of environmental concern with effective communication.	2			2		3					1	3					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)

Course Hand-out

Basic Electronics | EC 1101| 4 Credits | 3 1 0 4

Session: Jul 18 – Nov 18 | Faculty: Dr. Prashant Povel Dwivedi | Class: Core Subject

A. Introduction:

The growth of mobile telephony, broadband and wireless internet has led to the growth of career opportunities in the field of communication engineering. This course is a basic overview of electronic components and their common uses. It covers the characteristics and applications of analog and digital circuit components. Emphasis is placed on analysis, selection and applications. The coverage is not as deep as an electronics course aimed at electrical engineers. There are a number of physical applications demonstrated in this course that serve to motivate a wider audience. The course is ideal for someone who wants to gain a basic understanding of electrical circuits, hobbyists, or for someone who is considering electrical engineering as a career.

Review of physics, introduction to semiconductor devices: diodes and transistors. Equivalent circuits and models of semiconductor devices. DC biasing circuits for transistors. Analysis and design of transistor amplifiers. Operational amplifier systems. Number System, Boolean Algebra, Specification and implementation of combinational and sequential systems. Introduction to basic electronic communication systems.

B. Course Outcomes: At the end of the course, students will be able to

[EC1101.1] Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits their impacts and hence develop employability skills.

[EC1101.2] Analyse different biasing configurations of bipolar junction transistor and hence result in scope of entrepreneurship.

[EC1101.3] Analyse inverting or non-inverting amplifier structures comprising of operational amplifiers for lifelong learning and encouraging entrepreneurship.

[EC1101.4] Demonstrate interconversion on different number systems

[EC1101.5] Demonstrate minimization of Boolean expressions

[EC1101.6] Identify different parameters pertaining to analog modulation techniques

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Demonstrate and apply knowledge of Mathematics, Science, and Engineering to classical and recent problems of electronic design & communication system.

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of solutions**: Design a component, system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes , Activity feedbacks (Accumulated and Relative)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

PN Junction: Formation of depletion region, Effect of forward and reverse bias on depletion region, I-V characteristics and equivalent circuits of ideal and practical diode, Diode equation.

Application of Diode: Series and parallel combination of diodes circuits, Half Wave and Full Wave rectifiers, Capacitor filter, clipper, clamper circuits, Zener Diode; I-V Characteristics, Zener Regulators, LEDs.

Bipolar Junction Transistor: Construction, schematic diagram and characteristic of CE, CB Configuration, CC configuration w.r.t. CE, Relation between α and β, transistor biasing, Q-point, load line, fixed bias, self-bias, bias stabilization, Transistor as amplifiers, frequency response.

Operational Amplifier: Characteristics of an Op. Amp., Inverting and Non-inverting, amplifiers, Linear Circuit applications as voltage follower, integrator, differentiator, summing amplifier, subtractor.

Digital Electronics: Number systems, Boolean algebra, DeMorgan's Theorem, logic gates; Truth tables, SOP, POS form, K-map for minimization of Boolean expressions, Implementation of Boolean expressions with logic gates, Designing combinational circuits: Half and full adders, Half and full subtractor. Flip-flop: S-R flip-flops.

Communication Systems: Elements of communication systems, Examples of communication systems: Analog and optical communications.

F. TEXT BOOKS

1. R. L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory, Ninth edition, PHI.
2. A. P. Malvino, David J Bates, Electronic Principles, Seventh edition, TMH.
3. G. Kennedy, B. Davis, Electronic Communication systems, TMH.

G. REFERENCE BOOKS

Refer all course related books, other than text books here.

1. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, New Delhi. (1994).
2. B. P. Singh and Rekha Singh, Electronic Devices and Circuits, Second Edition, Pearson Education, 2013.

H. Lecture Plan:

LEC NO.	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Overview of Semiconductors	Recall concept of Semiconductors		EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
2	Introduction to Extrinsic Semiconductors	Understanding of Doping	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
3	Introduction to PN junction diode, Formation of depletion region	Understanding of switches	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
4	Forward and reverse bias, I-V Characteristics	Understanding of switch operation and their characteristics	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
5, 6	Equivalent circuits of ideal and practical diode	Model of the diode for circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
7	Diode equation	Introduction to the drift and diffusion in diode equation.	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
8	Tutorial				
9-11	Application to Diodes: Series and Parallel combination of diode circuits	Use of switches to get different function in electrical circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
12	Half and Full wave rectifiers	Introduction to pulsating D.C	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
13	Capacitor Filter	Introduction to Filters	Lecture	EC1101.1 (CO 1)	Class Quiz
14,15	Clipper circuits	Understanding of wave shaping circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
16	Clamper circuits	Understanding of wave shaping circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
17	Zener diode and its I-V characteristics	Understanding of voltage regulating device.	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term II, End Term
18, 19	Zener regulators, LEDs	Understanding of voltage regulating circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term II, End Term
20	Tutorial		Quiz 1		
21	Introduction to BJT	Understanding of three terminal devices	Lecture	EC1101.2 (CO 2)	Class Quiz
22	Operation of BJT	Understanding of minority carrier movement	Lecture	EC1101.2 (CO 2)	Class Quiz

23	Transistor configuration: symbolic representation and CB Characteristics.	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz
24	Transistor configuration: symbolic representation and CE Characteristics,	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz
25	CC configuration w.r.t. CE, Relation between α and β	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
26	Transistor Biasing, Q-point, Load line	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
27	Fixed biasing	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
28	Self-biasing, Bias stabilization	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
29	Transistor as an amplifier, Frequency response	Understanding of amplifier characteristic and its response with frequency variation	Lecture	EC1101.2 (CO 2)	Class Quiz
30	Tutorial		Quiz 2		
31	Introduction to Operational Amplifier, Op. Amp Characteristics.	Understanding the OPAMP characteristics and it's difference from BJT as an amplifier.	Lecture	EC1101.3 (CO 3)	Class Quiz
32	Inverting amplifier	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, Mid Term II, End Term
33	NON-Inverting amplifier, Linear applications of Op. Amp as voltage follower	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, Mid Term II, End Term
34	Summing amplifier, Subtractor	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, End Term
35	Integrator, Differentiator	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, End Term
36	Tutorial		Quiz 3		
37	Digital Electronics: Number system	Mathematical understanding of Number System	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
38	Number conversion, Binary addition	Application of a Number System in Digital Electronics.	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
39	Binary subtraction with complements (1's and 2's complement)	Understanding of Subtraction in Digital Electronics	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term

40	Boolean algebra, DeMorgan's theorem	Understanding the Algebra in Digital Electronics	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
41	Logic gates, Truth table.	Basic entities of Digital Electronics	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
42	Implementation of Boolean expression with logic gates	Use of Logic Gates to implement any Logic in Digital	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
43	SOP, POS forms	Understanding of various forms to represent a Logic	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
44	K-Map for minimization of Boolean expressions	A systematic way to minimize the given logic	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
45	Combinational Circuits: Half and Full adders	Understanding of Basic Combinational Circuits	Lecture	EC1101.5 (CO 5)	Class Quiz
46	Half and Full Subtractors	Understanding of Basic Combinational Circuits	Lecture	EC1101.5 (CO 5)	Class Quiz
47	S-R Flip Flop	Understanding of Basic Sequential Circuits	Lecture	EC1101.5 (CO 5)	Class Quiz
48	Tutorial				
49	Introduction to communication system	Basic concept of Communication	Lecture	EC1101.6 (CO 6)	Class Quiz
50	Analog and Digital communication	Understanding of different Communication Systems	Lecture	EC1101.6 (CO 6)	Class Quiz
51	Modulation techniques, Need for modulation	Understanding the importance of a Carrier and its Modulation	Lecture	EC1101.6 (CO 6)	Class Quiz
52	Types of Modulations.	Understanding the different ways to modulate a carrier	Lecture	EC1101.6 (CO 6)	Class Quiz, End Term
53	Tutorial		Quiz 4		

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[EC1101.1]	Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits their impacts and hence develop employability skills.	3	2	3	1			1					1			
[EC1101.2]	Analyse different biasing configurations of bipolar junction transistor and hence result in scope of entrepreneurship.	3	2	1	2	1							**1**			
[EC1101.3]	Analyse inverting or non-inverting amplifier structures comprising of operational amplifiers for lifelong learning and encouraging entrepreneurship.	3	3	3	2	**2**							1			
[EC1101.4]	Demonstrate interconversion on different number systems	3	2	3	2	**2**		1					1			
[EC1101.5]	Demonstrate minimization of Boolean expressions	**3**	3	1	**2**	**2**							1			
[EC1101.6]	Identify different parameters pertaining to analog modulation techniques	**3**	2	**2**	2		1						2			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-Out

Mechanics of Solids | ES1102|4 Credits |4 0 0 4

Session: Jul–Nov, 2018 | Faculty: Prof K. J. Sharma | Class: Core Subject

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course for first year students. Mechanics of solids includes important topics from Engineering Mechanics and Strength of Materials. The subject offers a basic understanding of different types of forces acting on rigid bodies at rest and in stage of motion. Most of the fundamentals needed to learn the basics of Engineering Mechanics and strength of materials are discussed in this subject. Strength of materials is a basic course essential for students of all branches of engineering. Modern research and advancement in field of stability, strength and design of structure and machines, dynamic effects. robotics, missiles. Aeroplane and aircraft design, automobiles and automatic control. fluid flow, engine performance, electrical machines, transmission tower, superstructure, heavy earthmoving machines, locomotives, metro railway, supersonic aircrafts, atomic and subatomic behaviour etc are highly dependent on basic principle of Mechanics of Solids In this coursework, students will be trained about methods of analysing forces, determination of centroid and moment of inertia of geometrical figures, determination of various stresses and strains, longitudinal and circumferential stresses and strains due to direct forces , thermal stresses; strains in metallic materials and stresses due to fluid pressures.. Also they will develop skill for testing various building and machinery materials such as- mild steel, cast iron etc. as per Indian standards guidelines. The course will include activities such as- assignments, quizzes, class tests, site visits, projects, focusing on the knowledge of students for lifelong learning and making them employable.

B. Course Outcomes: At the end of the course, students will be able to:

[ES1102.1] Develop the skill to evaluate forces in various engineering elements

[ES1102.2] To locate the centroid and determine the Moment of inertia of various bodies

[ES1102.3] Analysis of dynamics forces to be used in machinery and building component

[ES1102.4] To assess the engineering properties of material subjected to normal, shear and temperature stresses

[ES1102.5] To examine the stress and strain in thin cylinders and pipes along the longitudinal and circumferential direction

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Mechanics of Rigid Bodies: Introduction, basic principles and concepts, Force systems, resultant of concurrent and non- concurrent coplanar force systems; Equilibrium of concurrent and non-concurrent coplanar force systems. Centroid and Moment of Inertia of simple and composite areas, **Kinetics**:- Applications of D'Alembert's principle, work-energy and Impulse-Momentum principles. **Mechanics of Deformable Bodies**:- Mechanical properties of materials, normal stress and strain, Hooke's law, modulus of elasticity, tension test on ductile and brittle materials, factor of safety, allowable stress, Poisson's ratio, shear stress and shear strain, modulus of rigidity, relation between modulus of elasticity, modulus of rigidity and bulk modulus. Stresses and deformations in tapering bars, stepped bars, thermal stresses, statically indeterminate problems, Stresses on inclined planes, stresses in thin cylindrical pressure-vesse

F. TEXT BOOKS

1. *S.S.Bhavikatti, Engineering Mechanics 6th Edition2018,New Age International Publishers.*

2. *S.S. Bhavikatti, 3rd edition2010, Vikash Publishing HouseEngineering Mechanics*

G. REFERENCE BOOKS

3. *Beer and Johnson; Engineering Mechanics*
4. *R.K.Bansal; Engineering Mechanics, 3rd edition 2013., Laxmi Publication*
5. *Timoshenko; Strength of Materials*
6. *R.K.Rajput; Strength of Materials , 6th edition2o15 , S. Chand Publishing*

H. Lecture Plan:

Lecture No.	Topics to be covered
	PART-I MECHANICS OF RIGID BODIES
1	**Resultant of concurrent and non-concurrent forces:-** Definition of mechanics, force, principle of transmissibility
2	Classification of force system, resultant of concurrent coplanar forced, parallelogram and triangle law of forces, component of a force, resolution of a force, rectangular component of force and oblique components of a force
3	Illustrative Problems
4	Illustrative Problems
5	Illustrative Problems
6	Resultant of coplanar non –concurrent force system, moment of a force, couple, force and couple system, Varignon's theorem, types of loads on beams
7	Illustrative Problems
8	Illustrative Problems
9	**Equilibrium of concurrent and non con-current coplanar force system:** Definition, condition of equilibrium, Lami's theorem , space diagram and Free Body Diagram, types of supports, types of beams and types of loading
10	Problems on equilibrium of coplanar concurrent force system
11	Problems on equilibrium of coplanar concurrent force system
12	Problems on equilibrium of coplanar concurrent force system
13	Problems on resultant of coplanar non-concurrent force system
14	Problems on resultant of coplanar non-concurrent force system
15	Problems on resultant of coplanar non-concurrent force system
16	Tutorials based on L1-L15
17	**Centroid of plane area :-** Definition, derivation of Centroid of rectangle, circle,
18	Semi-circle, quarter circle, triangle, determination of centroid of composite area
19	Problems on determination of centroid of composite area
20	Problems on determination of centroid of composite area
21	Problems on determination of centroid of composite area
22	**Moment of Inertia:-- Definition,** Theorem of parallel and perpendicular axes, Radius of gyration, M. I. of standard plane lamina like rectangle, triangle and quarter circle
23-24	Problems on determination of M.I. for composite areas
25	**Kinetics of rectilinear motion:-** Newton's second law of motion, work energy principle and impulse momentum principle, D' Alembert's principle
26	Problems on kinetics using above methods
27	Problems on kinetics using above methods
	Part –II MECHANICS OF DEFORMABLE BODIES
28	**Simple Stresses and Strains:-** Introduction to mechanics of deformable, normal stress and strains, Hooke's law, modulus of elasticity

29	Tension test on ductile and brittle materials, factor of safety, allowable stress Tapering Problem:------Illustrative problems
30	Tapering bars, Illustrative problems
31	Stepped bars Illustrative problems
32	Shear stress, shear strain single and double shear, modulus of rigidity
33	Poisson's ratio, bulk modulus, relationship between volumetric strain and linear strain
34	Relationship between modulus of elasticity, modulus of rigidity and bulk modulus
35	Illustrative Problems
36	**Statically indeterminate members and thermal stresses:-** Compound bars subjected to external loads
37	Illustrative problems
38	Illustrative problems
39	Illustrative problems
40	Temperature stresses, compound bar subjected to temperature stresses, illustrative problems
41	Illustrative Problems
42	Illustrative Problems
43	**Stresses on inclined plane:-** equation of stresses on inclined planes, condition for maximum and normal stresses on a plane, concept of principal plane and principal stresses, condition for maximum shear stress on plane and plane of maximum shear stress, resultant stress on a plane
44	Illustrative examples
45	Illustrative problems
46	**Stresses in thin cylinder** due to fluid pressure :-Analysis of thin cylinders subjected to fluid pressure- hoop stress, longitudinal stress and strain, joint efficiencies
47	Illustrative problems
48	Illustrative problems and doubt clarification.

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	
[ES1102.1]	Develop the skill to evaluate forces in various engineering elements	3	2	2	1	1	1	2	1			1	1					
[ES1102.2]	To locate the centroid and determine the Moment of inertia of various bodies	3	3	2	3	3	2	1	1			1	1					
[ES1102.3]	Analysis of dynamics forces to be used in machinery and building component	3	2	3	3	3	1		1	2	3	1	1					
[ES1102.4]	To assess the engineering properties of material subjected to normal, shear and temperature stresses	3	2	2	2	2	2			2	2		1					
[ES1102.5]	To examine the stress and strain in thin cylinders and pipes along the longitudinal and circumferential direction.	3	2	2	2	2	2		1	2	2	1	1					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Automobile Engineering
Course Hand-out

Engineering Chemistry | CY1101 | 4 Credits | 2 1 1 4

Session: July - Nov 18 | Coordinator: Arunava Agarwala | Class: B.Tech. (I and II Sem)

A. Introduction: This course is offered by Dept. of Chemistry for all 1st year B.Tech. students. The objective of the course is to acquaint the students with the basic concepts of chemistry relevant to engineering field. The students with the knowledge of basic chemistry, will understand and explain scientifically the various chemistry related problems in the industry/engineering field.

B. Course Objectives: At the end of the course, students will be able to

[1101.1]. Understand and apply concepts of various types of fuel technology

[1101.2]. Develop new methods to produce soft water for industrial use.

[1101.3]. Understand the synthesis and applications of polymer science and polymer technology.

[1101.4]. Develop skills to synthesis, analysis and use of composite materials.

[1101.5]. Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.

[1101.6]. Acquire basic knowledge of Nanochemistry to appreciate its applications in the fields like medicine, opto-electronics, and electronics.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public healthand safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal,health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineeringpractice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions insocietal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projectsand in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	Quizz tests (Accumulated and Averaged)	10
	Laboratory Sessions	20
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Chemical Fuels: Classification; Calorific value and its determination; Analysis of solid fuel;Liquid Fuel: Distillation of petroleum, Petroleum cracking, Reforming of petrol, Octane numberand Cetane value, Synthetic petrol, Combustion based numerical; **Water Technology**: Hardnessof water; Units of hardness; Ion exchange water softening technique; Boiler feed water: scale &sludge, priming and foaming; **Polymers & Composites**: Molecular weight determination; Glasstransition temperature; Methods of polymerization; Mechanism of polymerization reactions;Compounding of plastics; Vulcanization; Conducting polymers; Synthesis, properties andapplications of some polymers; Composition and characteristic properties of composites; **Nano Chemistry:** Synthesis, properties and applications of selected nanomaterials; **Corrosion and its Control**: Theories alrd Mechanism of Corrosion; Types of corrosion; Factors affecting corrosion,Protection against gorrosion, Paints and Coatings: Antifouling Coating, Fire retardant paintsand Case studies.

F. Text Books

T1. Jain P.C. and Jain M., Engineering Chemistry, Dhanpat Rai and Sons, Delhi, Revised, 15th Edn. 2006.

T2. Kuriacose J.C., Raja R. J., Chemistry in Engineering and Technology, Vol. I/II TMH 1988

G. Reference Books

R1. None

H. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	**Chemical fuels:** Introduction, Classification, Units of heat, Calorific value: Gross calorific value and Net calorific value.	To acquaint and clear teachers expectations and understand student expectations	Lecture	1101.1	Class Quiz End Term
2.	Description of working of Bomb calorimeter for detection of caloric value of solid /non-volatile liquid fuel; Discussion about all corrections.	Recall working of the calorimeter	Lecture	1101.1	Class Quiz Mid Term I
3.	Numerical problems based on Bomb calorimeter.	Analyze and solve numerical problems	Activity	1101.1	Class Quiz End Term
4.	Description of working of Boy's calorimeter for detection of caloric value of gaseous fuel; Numerical problems based on Boy's calorimeter.	Describe calorimeter and its working principle	Lecture	1101.1	Home Assignment End Term
5.	Dulong's Formula; Numerical problems based on Dulong's Formula; Coal analysis: Proximate analysis.	Analyze and solve numerical problems	Lecture, Activity	1101.1	Class Quiz End Term
6.	Coal analysis: Ultimate analysis; Numerical problems related to Proximate and Ultimate analysis.	Analyze and solve numerical problems	Lecture, Activity	1101.1	Class Quiz Mid Term I End Term
7.	Liquid Fuels: Fractional Distillation, Petroleum Cracking - Fixed Bed catalytic cracking.	Recall principles of distillation, cracking	Lecture	1101.1	Class Quiz Mid Term I End term
8.	Moving bed Catalytic Cracking; Knocking, Octane number, Anti-knocking agents, Unleaded petrol and power alcohol, Cetane number.	Recall principles of cracking, knocking	Lecture	1101.1	Class Quiz Mid Term I End Term
9.	Reforming of Gasoline: Thermal and Catalytic reforming, Synthetic Petrol, Bergius process, Fisher Tropsch method.	Recall basic principles of fuels	Lecture, Activity	1101.1	Class Quiz Mid Term I End Term
10.	Numerical based on Combustion (By Weight Type).	Analyze and solve numerical problems	Activity	1101.1	Class Quiz Mid Term I End Term
11.	Numerical based on Combustion (By Volume Type).	Analyze and solve numerical problems	Activity	1101.1	Class Quiz End Term
12.	**Water Technology:** Introduction, Hardness of water, Important units of hardness.	Describe the properties of water and its aplication	Lecture	1101.2	Class Quiz Mid Term II End Term
13.	Numerical problems based on hardness.	Analyze and solve numerical problems	Lecture, Activity	1101.2	Class Quiz Mid Term II

					End Term
14.	Estimation of hardness: Soap solution method and EDTA method.	Describe working hardness/softness of water	Lecture	1101.2	Class Quiz Mid Term II End Term
15.	Softening of water: cold and hot Lime soda process and numerical problems (calculation of amount of lime and soda).	Analyze and solve numerical problems	Lecture, Activity	1101.2	Class Quiz Mid Term II End Term
16.	Softening of hard water by Ion exchange method and zeolite method.	Describe the conversion of hard water to soft water	Lecture	1101.2	Class Quiz End Term
17.	Internal treatment: Phosphate conditioning and Calgon conditioning.	Recall the conversion of hard water to soft water	Lecture	1101.2	Class Quiz End Term
18.	Boiler problems: scale and sludge formation,priming and foaming and preventive methods.	Recall the conversion of hard water to soft water	Lecture	1101.2	Class Quiz End Term
19.	**Polymers and Composites:** Definition and classification of polymers: based on structure, origin, tacticity, and heating behavior (thermo plastic/ thermosetting).	Describe the working of polymer	Lecture, Activity	1101.3	Class Quiz End Term
20.	Functionality; Degree of polymerization; Co-polymerization: alternating, random, block and graft polymers.	Describe the properties of polymer	Lecture	1101.3	Class Quiz End Term
21.	Molecular weight of polymers: Number average and weight average molecular weights, polydispersity index; Numerical problems based on average molecular weight.	Describe the properties of polymer, Analyze and solve numerical problems	Lecture, Activity	1101.3	Class Quiz End term
22.	Mechanism of free radical polymerization and ionic (both cationic and anionic) polymerization.	Recall the properties of polymer	Lecture, Activity	1101.3	Class Quiz End Term
23.	Mechanism of coordination polymerization (Zieglar Natta Catalyst), Condensation polymerization: definition and examples.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz Mid Term II End Term
24.	Polymerization techniques: Bulk, Solution, Suspension and Emulsion.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz Mid Term II End Term
25.	Glass transition temperature & factors affecting it.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz Mid Term II End Term
26.	Elastomer: Natural rubber, Vulcanization, Synthetic rubbers.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz End Term
27.	Preparation, properties and applications ofPolythene (LDPE and HDPE) and Nylon: 6, 6:6, 6:10, 11.	Identify alternative ways to synthesize polymers	Lecture, Activity	1101.3	Class Quiz End Term

28.	Preparation, properties and applications of Phenol Formaldehyde resins (Novolacs / Resols).	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz End Term
29.	Composites and its Classification.	Describe the properties of composites	Lecture	1101.4	Class Quiz End Term
30.	Characteristic Properties of Composites.	Describe the properties of composites	Lecture	1101.4	Class Quiz End Term
31.	Corrosion and its Control:Introduction, Significance, Chemical Corrosion, Pilling Bedworth Rule (Pilling–Bedworth ratio (P–B ratio).	Describe corrosion and its preventions	Lecture, Activity	1101.4	Class Quiz End Term
32	Electrochemical Corrosion.	Describe corrosion	Lecture	1101.5	Class Quiz End Term
33	Types of corrosion: Galvanic corrosion, Pitting corrosion.	Recall properties of corrosion	Lecture	1101.5	Class Quiz End Term
34	Water line Corrosion; Drop Corrosion; Stress corrosion (caustic embrittlement).	Recall properties of corrosion	Lecture	1101.5	Class Quiz End Term Practical End Term Theory
35	Factors affecting corrosion: the nature of the metal and environment.	Describe corrosion and its reasons	Lecture	1101.5	Class Quiz
36	Corrosion prevention by material selection and design; Protection against corrosion: Sacrificial anodic protection, Impressed current method, anodic protection; Corrosion inhibitors (cathodic/anodic).	Describe corrosion and its preventions	Lecture	1101.5	
37	Electroplating, galvanization, tinning and other metal coating methods.	Describe corrossion prevention	Lecture, Activity	1101.5	Class Quiz
38	Paints and Coatings: Antifouling Coating, Fire Retardants Paints.	Describe corrossion prevention	Lecture	1101.5	Class Quiz
39	**Nano-Chemistry**: Introduction, Synthesis of Nano Materials: Top down and Bottom up approach.	Describe nanochemistry	Lecture	1101.6	Class Quiz End Term Theory
40	Synthesis, properties and applications of Fullerenes and Carbon Nano tube.	Recall basics of nanochemistry	Lecture	1101.6	Class Quiz
41	General Properties of Nano Materials.	Recall nanomaterials	Lecture	1101.6	Class Quiz End Term Theory
42	Revision.	Recall and recap the lessons learnt during the semester	Activity	1101.1-6	Class Quiz Mid Term I Mid Term II End Term Theory
LAB SESSIONS	Lab sessions based on Alternative Fuel Synthesis, testing and fabrication of after exhaust device	Experiment and test different fuels on engines and analyse their impact on pollution reduction	Lab Sessions	1101.1-6	End Term Practical

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CY 1101.1	Understand and apply concepts of various types of fuel technology.	2						1			1		1			
CY 1101.2	Develop new methods to produce soft water for industrial.			1					1				1			
CY 1101.3	Understand the synthesis and applications of polymer science and polymer technology.	2				1					1		1			
CY 1101.4	Develop skills to synthesis, analysis and use of composite materials.						1		1				1			
CY 1101.5	Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.		1		1	1			1				1			
CY 1101.6	Acquire basic knowledge of Nanochemistry to appreciate its applications in the fields likemedicine, opto-electronics, and electronics.	2				1			1				1			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

First Year B. Tech.

Engineering Mathematics-II| MA1201 | 4 Credits | 3 1 0 4

Session: January 2019 – May 2019 | Faculty: Dr. Giriraj Methi & Dr. M.Rizwan | Class: First Year B. Tech. II Semester

A. **Introduction:** An engineering student needs to have some basic mathematical tools and technique which emphasizes the development of rigorous logical thinking and logical skills. Based on this, the course aims at giving adequate exposure to the theory and applications. The course is aimed at developing the basic mathematical skills of engineering students that are imperative for understanding the engineering subjects.

B. **Course Outcomes (Cos):** At the end of the course, students will be able to

[MA1201.1]: Demonstrate the understanding of First order and First Degree differential Equations

[MA1201.2]: Apply and solve higher order linear differential equations and simultaneous differential equations

[MA1201.3]: Develop the skill to use Beta Gamma function in mathematical problems

[MA1201.4]: Able to change order of double integration and double integral in Cartesian form to polar form and vice versa

[MA1201.5]: Solve triple integral find area and volume of solids using double integral

[**MA1201.6]:** Understand and can handle solid coordinate figure Sphere, Right circular cone and Right Circular Cylinder

C. **Program Outcomes and Program Specific Outcomes**

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes	30
End Term Exam (Summative)	End Term Exam (Only Handwritten class notes)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal.

E. Syllabus

MA1201 Engineering Mathematics-II

Ordinary Differential Equations: Solutions of first order and first degree differential equations, separable of variables, homogeneous and reducible to homogeneous equations, linear equations & Bernoulli equation, exact equations, reducible to exact. **Linear Higher Order Differential Equations:** Linear homogeneous equations with constant coefficients, inverse differential operators and method of variation of parameters, Solution of Cauchy's and Legendre's differential equations, solution of simple simultaneous linear differential equations. **Multiple Integrals:** Beta and Gamma Functions: elementary properties. Double and Triple integrals, area and volume by double integration, change of order of integration, change of variables from Cartesian to polar form and vice versa. **Analytical Solid Geometry:** Sphere, right circular cone, right circular cylinder.

A. TEXT BOOKS

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006.
2. E. Kreyszig, "Adianced Engineering Mathematics", Wiley India Edition, 2006.

B. REFERENCE BOOKS

1. B. Ram, “Engineering Mathematics", Vol. I and II, Pearson, 2012.
2. S. Pal & S. C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015

F. Lecture Plan

Lecture No.	Topics	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome

1.	Introduction of Ordinary differential equations-Definition, order & degree of a differential equation	Lecture	[1201.1]	Mid Term - I End Term
2.	Solution of first order and first degree differential equations using Variable separable method	Lecture	[1201.1]	Mid Term - I End Term
3.	Solution of Homogeneous differential equations	Lecture	[1201.1]	Mid Term - I End Term
4.	Equations reducible to homogeneous form	Lecture	[1201.1]	Mid Term - I End Term
5.	Problems of equations reducible to homogeneous form	Lecture	[1201.1]	Mid Term - I End Term
6.	Problem Solving	Tutorial	[1201.1]	Mid Term - I End Term
7.	Solution of Linear differential equations	Lecture	[1201.1]	Mid Term - I End Term
8.	Solution of Bernoulli's equation	Lecture	[1201.1]	Mid Term - I End Term
9.	Solution of Exact differential equations	Lecture	[1201.1]	Mid Term - I End Term

10.	Equations reducible to exact differetnial equations	Lecture	[1201.1]	Mid Term - I End Term
11.	Problems and different IF for reducible Exact differential equations	Lecture	[1201.1]	Mid Term - I End Term
12.	Problem Solving	Tutorial	[1201.]	Mid Term - I End Term
13.	Applications of first order and first degree differential equations in real world problems	Lecture	[1201.1]	Mid Term - I End Term
14.	Introduction and develop theory for CF	Lecture	[1201.2]	Mid Term - I End Term
15.	ways for finding CF	Lecture	[1201.2]	Mid Term - I End Term
16.	Linear homogenous higher order differential equations with constant coefficients	Lecture	[1201.2]	Mid Term - I End Term
17.	Problem Solving	Tutorial	[1201.2]	Mid Term - I End Term
18.	Inverse differential operator	Lecture	[1201.2]	Mid Term - I End Term
19.	Rules for finding Particular integral for	Lecture	[1201.2]	Mid Term - I End Term

	exponential and trigonometrical cases			
20.	Rules for finding Particular integral for remaining cases	Lecture	[1201.2]	Mid Term - I End Term
21.	Develop Method of variation of parameters	Lecture	[1201.2]	Mid Term – II End Term
22.	Problems related to method of varation of parameter	Lecture	[1201.2]	Mid Term – II End Term
23.	Solution of Cauchy's equation	Lecture	[1201.2]	Mid Term – II End Term
24.	Problem Solving	Tutorial	[1201.2]	Mid Term – II End Term
25.	Solution of Legendre's equation	Lecture	[1201.2]	Mid Term – II End Term
26.	Solution of simple simultaneous linear differential equations	Lecture	[1201.2]	Mid Term – II End Term
27.	Problem Solving	Tutorial	[1201.2]	Mid Term – II End Term
28.	Applications of Linear higher order differential equations in real world problems	Lecture	[1201.2]	Mid Term – II End Term

29.	Beta & Gamma functions: Concept and Definitions	Lecture	[1201.3]	Mid Term – II End Term
30.	Properties and problems of beta function	Lecture	[1201.3]	Mid Term – II End Term
31.	Properties and problems of Gamma function	Lecture	[1201.3]	Mid Term – II End Term
32.	Problem Solving	Tutorial	[1201.3]	Mid Term – II End Term
33.	Double Integral & Tripal Integral	Lecture	[1201.4]	Mid Term – II End Term
34.	Area by double integration	Lecture	[1201.4]	Mid Term – II End Term
35.	Volume by double integration	Lecture	[1201.4]	Mid Term – II End Term
36.	Problem Solving	Tutorial	[1201.4]	Mid Term – II End Term
37.	Change of order of integration	Lecture	[1201.4]	Mid Term – II End Term
38.	Change of variables from Cartesian to polar form	Lecture	[1201.5]	Mid Term – II End Term
39.	Change of variables from Polar to Cartesianform	Lecture	[1201.5]	Mid Term – II End Term

40.	Problem Solving	Tutorial	[1201.5]	Mid Term – II End Term
41.	Three D: Basic Concepts	Lecture	[1201.6]	End Term
42.	Introduction to Sphere Equation of sphere with problems	Lecture	[1201.6]	End Term
43.	plane section of sphere	Lecture	[1201.6]	End Term
44.	Problem Solving	Tutorial	[1201.6]	End Term
45.	Right circular cone	Lecture	[1201.6]	End Term
46.	Right circular cylinder	Lecture	[1201.6]	End Term
47.	Problems based on right circular cone & cylinder	Lecture	[1201.6]	End Term
48.	Problem solving	Lecture	[1201.6]	End Term

G. Course Articulation Matrix (Mapping of COs with POs and PSOs) for Data Communications:

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1201.1	Demonstrate the understanding of First order and First Degree differential Equations	3	2	3	1	1		1			1		1				
2101.2	Apply and solve higher order linear differential equations and simultaneous differential equations	3	2	1	2	1		1			1		1				
1201.3	Use Beta Gamma function in mathematical problems	3	3	2	2	1		1			1		1				
1201.4	Able to change order of double integration and double integral in Cartesian form to polar form and vice versa	2	1	2	1	1		1			1		1				
1201.5	Solve triple integral find area and volume of solids using double integral	2	3	1	1	1		1			1		1				
1201.6	Understand and can handle solid coordinate figure Sphere, Right circular cone and Right Circular Cylinder	1	1	1	1	1		1			1		1				

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics and Communication

Department of Electrical Engineering
Course Hand-out

Electrical Engineering | EE 1101 | 4 Credits | 4 0 0

Session: Jan. 19 – May 19 | Faculty: Dr. Sunil Kumar Goyal | Class: First Year (All Branches)

A. Introduction: This course is offered by Dept. of Electrical Engineering as a basic fundamental subject to impart essential knowledge and information of Electrical Technology and their applications. The learning objective would cover the following aspects: -

a) To develop circuit designing skills through general insight of circuit laws and theorems.
b) To analyse the magnetic & electric circuit and calculate different parameters
c) To develop and analyse the single and three phase circuits.
d) To understand the concepts of basic construction & operation of transformer.
e) To understand the fundamentals of DC & Induction motors and measuring Instruments.

B. Course Outcomes: At the end of the course, students will be able to

[1101.1]. Recall basic circuit laws and apply theorems to analyse different types of DC circuits.
[1101.2]. Analyze and illustrate the comparison between linear electric & magnetic circuits.
[1101.3]. Identify and evaluate different configurations of single phase & three phase ac circuits.
[1101.4]. Understand the construction and operating principle of transformer.
[1101.5]. Illustrate the basic operating principles of DC machines & Induction motors and fundamental measuring Instruments

A. Program Outcomes and Program Specific Outcomes

[PO.1].Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2].Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3].Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4].Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5].Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6].The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7].Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8].Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9].Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

B. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

C. Syllabus

Introduction to Indian power scenario, Domestic appliances, Basic circuit elements, Source Transformation, Series & parallel resistive circuits, Review of Kirchhoff's laws, Star Delta Transformations, **DC Circuit Analysis:** Mesh and Node voltage analysis, DC Network Theorems-Superposition, Thevenin, Norton, Maximum Power Transfer. Capacitor and Inductor Series & Parallel connections, Charging & Discharging, Energy stored. **Magnetic circuits:** Terminologies, Analysis of series and parallel magnetic circuits, Review of Electromagnetism, Electromagnetic Induction, Fleming's left & right hand rules, Faradays laws, Lenz's law, Induced emf in a conductor & coil, Mutual Inductance, Coupling Coefficient and dot rule. **Single phase AC circuits:** Generation, EMF induced, Average value, RMS value, Peak factor, Form factor, Phasors, Analysis of Pure R, L, C Series and parallel combinations (RL, RC and RLC circuits), Power, Power factor, series and parallel Resonance. **Three phase AC Circuits:** Star and Delta connections, Analysis with balanced loads, Power measurements. **Transformers:** Single phase transformer- types, Construction, working principle, ideal and practical transformers, losses, Efficiency, Regulation. **Electrical Motors:** Introduction of Single & Three phase Induction motors, DC Motors. **Electrical Instruments:** Fundamentals of Electrical Measuring Instruments.

D. TEXT BOOKS

1. Nagasarkar & Sukhija, Basic Electrical Engineering, Oxford University Press, 2006.
2. S.K. Sahdev, Fundamentals of Electrical Engineering & Electronics, Dhanpat Rai & Co, 2010.
3. D. C. Kulsheshtha, Basic Electrical Engineering, McGraw Hill Education India, 2011.

E. REFERENCE BOOKS

1. S. N. Singh, Basic Electrical Engineering, PHI, 2011.
2. D. P. Kothari. & I. J. Nagarath, Basic Electrical Technology, TMH 2004.

F. Lecture Plan:

Lec No	**Topics**	**Session Objective**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
L1	Introduction to the Course	To acquaint students with the outcome based education (OBE) and Course outcome (CO) and program outcome (PO) assessment process	Lecture		NA
L2	Basic circuit elements, Source Transformation	Recall the basic elements of a DC network	Lecture	[1101.1]	Class Quiz
L3	Series & parallel resistive circuits, Review of Kirchhoff's laws	Identify different series and parallel network configurations and their equivalent resistance calculation	Lecture	[1101.1]	Home Assignment Class Quiz
L4-L5	Star-Delta transformation	Explain the need of star-delta transformation and their applications	Lecture	[1101.1]	Home Assignment Class Quiz
T1	L1 – L5	Numerical problems based on L1-L5	Tutorial	[1101.1]	Mid Term Exam
L6 – L7	DC Circuit Analysis – Mesh & Node analysis methods	Recall KVL and KCL and apply them to find solution of different dc network problems using Mesh & Node analysis methods	Lecture	[1101.1]	Mid Term Exam
T2-T3	L6 – L7	Numerical problems based on L6-L7	Tutorial	[1101.1]	Mid Term Exam
L8-L11	DC Network Theorems: Superposition, Thevenin, Norton, Maximum Power Transfer	Analyze and solve different dc network problems using all mentioned theorems	Lecture	[1101.1]	Home Assignment Class Quiz Mid Term Exam
T4-T5	L8-L11	Numerical problems based on L8-L11	Tutorial	[1101.1]	Mid Term Exam
L12	Capacitor, Series & Parallel connections, Charging & Discharging, Energy stored	Recall series and parallel connection of capacitors and energy stored	Lecture	[1101.2]	Class Quiz
L13	Inductor, Series & parallel connections, Growth & Decay of current in inductive circuit, Energy Stored	Recall series and parallel connection of inductors and energy stored	Lecture	[1101.2]	Class Quiz
T6	L12 – L13	Numerical problems based on L12-L13	Tutorial	[1101.2]	Class Quiz
L14– L15	Magnetic circuits, Terminologies, Analysis of series and parallel circuits	Recall the concept of magnetic circuits and their configurations	Lecture	[1101.2]	Class Quiz
L16	Review of Electromagnetism, Electromagnetic Induction, Fleming's left & right hand rules, Lenz's Law	Recall the Fleming's rule, Lenz's law, Faraday's law and review the concept of Electromagnetism	Lecture	[1101.2]	Class Quiz
L17– L18	Induced emf in a conductor & coil, Mutual Inductance, Coupling Coefficient and dot rule	Describe the concept of emf induced in coil, dot rule and Coupling Coefficient	Lecture	[1101.2]	Class Quiz
T7-T8	L14– L18	Numerical problems based on L14-L18	Tutorial		Class Quiz
L19-L20	Single phase circuits: Generation, Emf induced, Average value, RMS value, Peak factor, Form factor	Describe the concept of generation of ac voltage and waveform analysis	Lecture	[1101.3]	Class Quiz

L21 – L24	Phasors, Analysis of pure R, L, C, Series RL, RC and RLC circuits, Impedance, Power, Power factor	Describe the phasor operations and calculation of different quantities pertaining to different combinations of series ac circuits	Lecture	[1101.3]	Mid Term Exam
L25-L26	Analysis of Parallel RL, RC and RLC circuits	Analyze and calculate different quantities pertaining to parallel ac circuits	Lecture	[1101.3]	Mid Term Exam
T9-T10	L19 – L26	Numerical problems based on L19-L26	Tutorial	[1101.3]	Mid Term Exam
L27 – L28	Series & Parallel Resonance, Resonant frequency, Voltage & Current magnification	Recall and examine the series and parallel resonance phenomenon	Lecture	[1101.3]	Class Quiz
T11	L27– L28	Numerical problems based on L27-L28	Tutorial	[1101.3]	Class Quiz
L29-L30	Three phase ac circuits, Advantages, Types of connections, Voltage & Currents, Line & Phase values	Identify and analyse different types of Three phase ac circuits	Lecture	[1101.3]	Class Quiz
L31-L32	Analysis of balanced 3 wire & 4 wire star and delta connected systems, Phasor diagrams	Analyze three phase balanced star and delta connected systems	Lecture	[1101.3]	Mid Term Exam
L33	Measurement of three phase power by two wattmeter method	Examine two wattmeter method for three phase power Measurement	Lecture	[1101.3]	Mid Term Exam
T12-T13	L29 – L33	Numerical problems based on L29-L33	Tutorial	[1101.3]	Class Quiz
L34	Single phase transformer: Introduction, types, Construction, Operating principle, Emf equation	Recall and analyse operating principle of Single phase transformer and their types	Lecture	[1101.4]	Class Quiz
L35 – L36	Ideal & practical transformer, Losses and Efficiency, Voltage regulation	Compare the ideal and practical transformer and analyse different performance parameters	Lecture	[1101.4]	Mid Term Exam
T14	L34 – L36	Numerical problems based on L34-L36	Tutorial	[1101.4]	Class Quiz
L37 - L38	Introduction of single and three phase induction motors	Describe the operating principle of single and three phase induction motors	Lecture	[1101.5]	Class Quiz
L39-L40	DC Machine: Introduction, Construction, Types	Describe the construction and operating principle of DC machine	Lecture	[1101.5]	Class Quiz
L41-L42	Fundamentals of Electrical Measuring Instruments	Describe the construction and operating principle of different Measuring Instruments	Lecture	[1101.5]	Class Quiz

C. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
EE 1101.1	Develop circuit designing skills through general insight of circuit laws and theorems.	3	2										2			
EE 1101.2	Analyze and illustrate the comparison between linear electric & magnetic circuits.	2	1										2			
EE 1101.3	Identify and evaluate different configurations of single phase & three phase ac circuits.	1	2										3			
EE 1101.4	Understand the construction and operating principle of transformer and evaluate efficiency.	2	2	1			1	1					2			
EE 1101.5	Illustrate the basic operating principles of DC & Induction motors and fundamental measuring Instruments.						1	1								

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

D. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
EE 1101.1	Develop circuit designing skills through general insight of circuit laws and theorems.	3	2										2	3		
EE 1101.2	Analyze and illustrate the comparison between linear electric & magnetic circuits.	2	1										2	1		
EE 1101.3	Identify and evaluate different configurations of single phase & three phase ac circuits.	1	2										3	3	1	
EE 1101.4	Understand the construction and operating principle of transformer and evaluate efficiency.	2	2	1			1	1					2	1	2	
EE 1101.5	Illustrate the basic operating principles of DC & Induction motors and fundamental measuring Instruments.						1	1						1		

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

First Year B. Tech.

Programming in C | CS 1101 | 4 Credits | 2 1 2 4

Session: January 2019 – May 2019 | Faculty: Dr. Manoj Kumar Sharma | Class: First Year B. Tech. II Semester

A. Introduction:

The main objective of this course is for students to be aware with basic computer fundamentals, number systems and to enhance problem solving and logic design skills through writing set of instructions to solve a real world problem through C programming. Students will spend a significant time on each topic to understand their essential requirements and to use them differently with distinct programmable problems.

B. Course Outcomes (Cos): At the end of the course, students will be able to

[CS1101.1]: Described a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.

[CS1101.2]: Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.

[CS1101.3]: Understand bitwise operations and conversion of numbers in different representations through Number System.

[CS1101.4]: Developing skills in students to learn memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.

[CS1101.5]: Students learned the concept of re-usability by means of functions in C and to illustrate the concept of data base using file handling.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and/or Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Open Handwritten Notes)	40
Lab	Practical Lab	20
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

CS1101 PROGRAMMING IN C

Computer Fundamentals: The von Neumann Architecture, flowcharts and algorithms, operating system fundamentals (Linux), programs, assembly language, high level programming languages;

Number System: Binary, decimal, octal, hexadecimal.

C Programming: Data types, variables, operators, expressions, statements, control structures, functions, recursion, arrays and pointers, records (structures), files, input/output, standard library functions and elementary data structures.

A. TEXT BOOKS

1. E. Balagurusamy, "Computer Fundamentals & C Programming", TMH, 2008.
2. Y. P. Kanetkar, "Let us C", 12th Edition, BPB Publication, 2014.

B. REFERENCE BOOKS

1. B. W. Kernighan, D. M. Ritchie, "The C Programing Language", 2nd Edition, Prentice Hall of India, 1988.
2. B. Gottfired, "Schaum's Outline Series: Programming with C", 3rd Edition, McGraw Hill Publication, 2004.

F. Lecture Plan

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Awareness with course objectives, outcomes and applications	Basic Terminology, Flow Chart Designing, Algorithm Writing Styles, Applications of an Algorithm	Practical Applications, Real world problems	[1101.1]	Mid Term - I End Term
2.	The von Neumann Architecture		Lecture	[1101.1]	Mid Term - I End Term
3.	Flowcharts and algorithms		Lecture & Activity	[1101.1]	Mid Term - I End Term
4.			Lecture	[1101.1]	Mid Term - I End Term
5.	Operating system fundamentals (Linux)	Basic terminology, examples and commands	Lecture & Problem Solving Practice	[1101.1]	Mid Term - I End Term
6.					
7.	Programs, assembly language, high level programming languages;	Discussion, examples and facts	Lecture & Problem Solving Practice	[1101.1]	Mid Term - I End Term
8.					
9.	Data types	Concept discussion, programming examples	Lecture &	[1101.2]	Mid Term - I End Term

10.	Variables		Problem Solving Practice	[1101.2]	Mid Term - I End Term
11.	Operators			[1101.2]	Mid Term - I End Term
12.	Expressions	Concept discussion, programming examples	Lecture & Problem Solving Practice	[1101.2]	Mid Term - II End Term
13.	Statements		Lecture & Problem Solving Practice	[1101.2]	Mid Term - II End Term
14. 15. 16. 17. 18. 19.	**Number System:** Binary, decimal, octal, hexadecimal	Concept discussion, number system conversion, programming examples	Lecture & Problem Solving Practice	[1101.3]	Mid Term - I End Term
20. 21. 22.	Control structures	Concept discussion, programming examples	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
23. 24. 25.	Functions	Function writing, parameter passing, types of functions and their flexible use	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
26. 27. 28.	Recursion, arrays	Recursive functions and parameter passing, array defining and use	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
29. 30. 31. 32.	Pointers	Dynamic use of memory address, pointer as array, function argument passing through pointers etc.	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
33. 34. 35. 36.	Records (structures), files, input/output,	Data file creation, different types of file operations etc.	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
37. 38. 39. 40. 41. 42.	Standard library functions and elementary data structures	Exploration of inbuilt library functions, user define data structures	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term

G. Course Articulation Matrix (Mapping of COs with POs and PSOs) for Data Communications:

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1101.1	Described a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.	3	3							1	2		1				
1101.2	Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.	2	2	1		1				1	1						
1101.3	Understand bitwise operations and conversion of numbers in different representations through Number System.	3	2	1							1						
1101.4	Developing skills in students to learn memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.	2	3	3						1	2	2	2				
1101.5	Students learned the concept of re-usability by means of functions in C and to illustrate the concept of data base using file handling.	2		2				1	1				1				

1- Low Correlation : 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Mechanical Engineering
Course Hand-out

Engineering Thermodynamics| ES 1103 | 3 Credits | 3 0 0 3

Session: Jan 19 – May 19 | Faculty | Class: Ist Year

A. Introduction: Thermodynamics is a basic science that deals with equilibrium, energy and its transformation, and the laws governing such transformation. These laws are of wide applicability and are used in several branches of engineering and science. Principles and concepts of thermodynamics are important and indispensable tools in the innovation, design, development and improvement of engineering process, equipment and devices which deal with effective utilization of energy. Notable applications of engineering thermodynamics in the field of energy technology are:

power producing devices, e.g., internal combustion engines and gas turbines, steam and nuclear power plant, power consuming devices, e.g., fans, blowers and compressors, refrigeration and air conditioning plants, chemical process plant and direct energy conversion devices. It is essential that every engineer should have a thorough knowledge of thermodynamics and hence thermodynamics has been an essential part of engineering curricula all over the world.

B. Course Outcomes: At the end of the course, students will be able to

[ES1103.1] Understand the fundamental concepts of thermodynamics such as temperature, pressure, system, properties, process, state, cycles and equilibrium in the context of engineering applications.

[ES1103.2] Apply first law of thermodynamics on flow and non-flow processes.

[ES1103.3] Design and analyse the concept of components (compressor, turbine, pump, etc.) with the use of thermodynamic law.

[ES1103.4] Analyse the concept of second law and entropy in the context of thermal applications.

[ES1103.5] Apply the concept of first & second law of thermodynamics to design/utilize the power generating and power consuming devices.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

[PO.2]. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

[PO.3]. Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

[PO.4]. **Conduct investigations** of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

[PO.5]. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an under- standing of the limitations.

[PO.6]. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

[PO.7]. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

[PO.8]. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

[PO.9]. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

[PO.10]. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

[PO.11]. **Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to owners own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. **Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	Quizzes (Open Book/Close Book) and Assignments	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. A student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Definitions & Concepts: SI Units; System, Thermodynamic Properties of Fluids: Mathematical, Tabular and Graphical representation of data; Ideal gas Van der Waals Equation of state; Compressibility chart; Thermodynamic Diagrams including Mollier diagram; Steam Tables. Zeroth Law of thermodynamics: temperature scale. First Law of Thermodynamics: Applications to Non flow processes, Applications of First Law of Thermodynamics of Flow Processes – Steady State / Transient; Applications of First Law of Thermodynamics to Chemically Reacting Systems. Second Law of Thermodynamics: Applications. Thermodynamic Relations: Thermodynamic Potentials, Maxwell's Relations; Availability. Power Cycles and Refrigeration Cycles, Gas-Vapor Mixtures and Psychrometry.

F. Text Book:

T1. An Introduction to Thermodynamics, YVC Rao, Universities Press (India) Private Limited, Revised Edition, 2004.

G. Reference Book:

R1. Thermodynamics: An Engineering Approach, Y.A. Cengel and M.A. Boles, McGraw Hill (Fifth Edition), 2006.

H. Lecture Plan:

Lec No	**Topics**	**Session Objective**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction to Thermodynamics	Know the basics of the course and understand its applications	Lecture	ES1103.1	Home Assignment and Class Quiz Mid-Term I End-Term
2	Concepts and Definitions- System, Surroundings, Intensive and Extensive Properties, Energy, Equilibrium	Discuss the terms system and surroundings, thermodynamic properties and describe their use	Lecture	ES1103.1	
3	Equilibrium, Stability, Process, Work	Understand the criteria of thermal equilibrium, mechanical equilibrium and chemical equilibrium	Lecture	ES1103.1	
4	Work, Definition of Thermodynamics, Modes of work, Heat	Brief about the thermodynamics definition of work, distinguish between heat and work and identify their effects	Lecture	ES1103.1	Home Assignment and Class Quiz Mid-Term I End-Term
5	Thermodynamic Properties of Fluids- Concepts of phases, Equations of state	Understand a pure substance and a phase and phase transformation	Lecture	ES1103.1	
6	Ideal gas, van der Waals equation, Critical constants	Understand the concept of ideal gas and van der Walls equation of state	Lecture	ES1103.1	
7	Other equations of state, Compressibility chart, Reduced equation of state, Generalized compressibility chart	Use of compressibility chart and generalized compressibility chart and its applications	Lecture	ES1103.1	Home Assignment and Class Quiz Mid-Term I End-Term
8	Graphical representation of data – T-V diagram, P-V diagram, P-T diagram, Mollier diagram	Understand various thermodynamic diagrams like T-v, P-v, P-T, and Mollier diagram	Lecture/Activity	ES1103.1	
9	Tabular representation of data, Steam table	Estimating the properties of steam using steam tables.	Lecture/Activity	ES1103.1	
10	Zeroth law of thermodynamics, First law of thermodynamics-History	Understand the Zeroth law of thermodynamics	Lecture	ES1103.1 ES1103.2	Home Assignment and Class Quiz Mid-Term I End-Term
11	First law of thermodynamics, Consequences, Analysis of elementary processes	Know the genesis of the first law of thermodynamics	Lecture	ES1103.2	
12	Analysis of elementary	Apply the first law of	Lecture	ES1103.1	

	processes, Isothermal processes, Adiabatic processes, Polytropic processes	thermodynamics to analyse different thermodynamics process		ES1103.2	
13	Constant internal energy processes	Apply the first law of thermodynamics to analyse constant internal energy process	Lecture	ES1103.1 ES1103.2	Home Assignment and Class Quiz Mid-Term I End-Term
14	First law analysis of processes – Control mass analysis, Control volume analysis	Explain the control mass and control volume analysis	Lecture	ES1103.2 ES1103.3	
15	Applications of steady state flow processes, Throttling process, Applications of throttling	Analyse the steady flow processes and its applications	Lecture	ES1103.2 ES1103.3	
16	Transient flow processes, Case of an ideal gas	Analyse the transient flow processes.	Lecture	ES1103.1 ES1103.2 ES1103.3	Home Assignment and Class Quiz Mid-Term II End-Term
17 & 18	Second law of thermodynamics- Heat engine, Heat pump or refrigerator, Second law of thermodynamics	Understand the concept of second law and its requirement	Lecture/Lab Visit	ES1103.4	
19	Kelvin, Plank, and Clausius statement, Reversible and Irreversible reactions, Criteria for irreversible processes	Understand the statements of second law of thermodynamics and also discuss the criteria for irreversible process	Lecture	ES1103.4	
20	Carnot cycle, Carnot theorem, Thermodynamic temperature scale	Understand the Carnot cycle and its use in thermodynamics	Lecture	ES1103.4	Home Assignment and Class Quiz Mid-Term II End-Term
21	Clausius inequality, Entropy, Calculation of entropy change	State the Clausius inequality and calculate the entropy change of the system	Lecture	ES1103.4	
22	Principles of entropy increase, Temperature-entropy diagram	Understand the principles of entropy increase and its reason	Lecture	ES1103.4	
23	Available energy, Loss in available energy,	Define the available and unavailable energy through the concept of second law	Lecture	ES1103.4	Home Assignment and Class Quiz Mid-Term II End-Term
24	Availability and Irreversibility	Estimate the loss in available energy in a given process	Lecture	ES1103.4	
25	Thermodynamic relations- Maxwell's relations, Mnemonic diagram, Thermodynamic potentials	Understand the importance the Maxwell's relations	Lecture	ES1103.3 ES1103.4	

26	Thermodynamic potentials, Mathematical preliminaries, Entropy relations	Know the thermodynamic potentials	Self-Study	ES1103.3 ES1103.4	Home Assignment and Class Quiz Mid-Term II End-Term
27	Joule-Thompson coefficient, Clapyeron equation, Gibb's phase rule	Understand the Joule-Thompson coefficient, Clapyeron equation, Gibb's phase rule	Lecture	ES1103.3 ES1103.4	
28	Power and Refrigeration cycles-Classification, Vapor power cycles, Carnot vapor power cycle,	Classify the power cycles into vapour cycles and gas power cycles	Lecture	ES1103.1 ES1103.3 ES1103.5	Home Assignment and Class Quiz End-Term
29	Ideal Rankine cycle and practical Rankine cycle	Explain the basics of Rankine cycle and estimate the thermal efficiency of an Ideal and actual Rankine cycle	Lecture	ES1103.1 ES1103.3 ES1103.5	
30 & 31	Gas power cycles, Otto cycle, Diesel cycle	Analyse the Otto and diesel cycle	Lecture/Lab Visit	ES1103.1 ES1103.3 ES1103.5	
32	Comparison of Otto and Diesel cycle, Air standard dual cycle	Analyse the differences in Otto, Diesel and dual cycle	Lecture	ES1103.1 ES1103.3 ES1103.5	Home Assignment and Class Quiz End-Term
33	Ideal and Actual Brayton cycle	Analyse air standard Brayton cycle	Lecture	ES1103.1 ES1103.3 ES1103.5	
34 & 35	Refrigeration cycle, Vapor compression refrigeration cycle	Understand the practical refrigeration cycle and its components	Lecture/Lab Visit	ES1103.1 ES1103.3 ES1103.5	
36	Refrigerants, Gas refrigeration cycle	Know the criteria in selection of refrigerants and their use	Self-study	ES1103.1 ES1103.3 ES1103.5	Home Assignment and Class Quiz End-Term
37	Gas vapor mixtures and Psychrometry, ideal gas mixtures	Predict the properties of an ideal gas mixture from knowledge of the properties of the constituent species	Lecture	ES1103.1 ES1103.2 ES1103.5	
38	Psychrometer, Psychrometric chart	Use the psychrometric charts in the analysis of process of dealing with air-water vapour mixtures	Activity	ES1103.1 ES1103.5	

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ES1103.1	Understand the fundamental concepts of thermodynamics such as temperature, pressure, system, properties, process, state, cycles and equilibrium in the context of engineering applications.	3													1	
ES1103.2	Apply first law of thermodynamics on flow and non-flow processes.	3	2													
ES1103.3	Design and analyse the concept of components (compressor, turbine, pump, etc.) with the use of thermodynamic law.	3		3	2										1	
ES1103.4	Analyse the concept of second law and entropy in the context of thermal applications	3	2	3	2		2	2							1	
ES1103.5	Apply the concept of first & second law of thermodynamics to design/utilize the power generating and power consuming devices.	3	3	3			2	2							1	

MANIPAL UNIVERSITY JAIPUR

B.Tech 1st Year

Course Hand-out

History of Indian Science & Technology | HS1102| 2 Credits | 2 0 0 2

Session: JAN-MAY 2019 | Faculty Coordinator- Dr Arun Kumar Poonia| Class: B.Tech 1st Year

Introduction: The course is designed to enable students to know and to develop an understanding about the history of Indian science & technology and the contribution of India in the field of science & technology.

A. Course Objectives: At the end of the course, students will be able to

HS1102.1 Identify the contribution of India in the field of science and technology.

HS1102.2 Understand the contribution of ancient Indians in the field of science and technology for answering general knowledge questions during interviews for future employment

HS1102.3 Analyse ancient Indian education system and reasons for its going into oblivion.

HS1102.4 Examine the growth of Indian science and technology in the 20th century A.D.

B. Program Outcomes

[PO.1]. **Engineering knowledge**: Demonstrate and apply knowledge of Mathematics, Science, and Engineering to classical and recent problems of electronic design & communication system.

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of solutions**: Design a component, system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	15
	Sessional Exam II	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

An introduction and need to learn History of Indian science and technology; Early civilizations and their impact on development of science and technology; Contribution of Indian science and technology in the fields of mathematics, astronomy, medical science, architecture, metallurgy, agriculture, yoga; Discoveries and inventions; Indian education system; Possible reasons of oblivion; Effect of historical developments (pre and post-independence era), Policy measures; Case studies.

F. TEXT BOOKS

1. Lecture notes

G. REFERENCE BOOKS

1. Indian Science and Technology in Eighteenth century, Dharampal, reprint of first edition (1983), Academy of Gandhian Studies, Hyderabad.

2. The Beautiful Tree: Indigenous Indian Education in the Eighteenth century, Dharampal, second edition (1995) Keerthi Publishing house, Coimbatore

3. India's Glorious Scientific Tradition, Suresh Soni, first edition (2008) Prabhat Prakashan

H. Lecture Plan:

Lecture No	**Topics**	**Session Objective**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction to the subject	To acquaint and clear teacher's expectations and understand students' expectations.	Lecture, Discussion	1102.1	Quizzes, 1st Sessional, End Term Examination
2	Why History to Engineers?	To ascertain the interest and the understanding of the students with focus on the need of this subject for them and its connection with the existing knowledge.	Lecture, Discussion	1102.1	Quizzes, 1st Sessional, End Term Examination
3	A Brief overview of India's contribution in Various Fields of Studies- I	To know about the scientific developments of the period. To know about the concepts of science, maths, technology, etc. used in the ancient times. To know about the major works of ancient Indians in the field of Science and Maths.	Discussion, Video	1102.1	Quizzes, 1st Sessional, End Term Examination
4	A Brief overview of India's contribution in Various Fields of Studies – II	To know about the scientific developments of the period. To know about the concepts of science, maths, technology, medicine, surgery, language, etc. in the ancient times. To know about the major works of ancient Indians in various fields of studies.	Lecture, PPT, Discussion	1102.1	Quizzes, 1st Sessional, End Term Examination
5	Ancient Civilizations and Science & Technology- With focus on Indus Valley Civilization	To know about the development and extent of Indus Valley Civilization. To know about the use of concepts of science & technology in Indus Valley Civilization.	PPT, Videos	1102.1	Quizzes, 1st Sessional, End Term Examination

6	Detailed Study about some aspects of Indus Valley Civilization	To know about the town planning/buildings/structures of Indus Valley Civilization. To know and study in detail about the city of Lothal and Harappa.	Lecture, PPT, Discussion	1102.2	Quizzes, 1st Sessional, End Term Examination
7	Ancient Indian Education System-1	To know about the educational system of ancient India. To know about the major fields of studies.	Lecture, PPT	1102.3	Quizzes, 1st Sessional, End Term Examination
8	Ancient Indian Education System-2	To know more about the educational system of ancient India. To know about the major fields of studies.	Discussion	1102.3	Quizzes, 1st Sessional, End Term Examination
9	Our ancient Universities- Nalanda and Takshila	To know about the educational system followed at these Universities and the scholars of those times. To know about the major fields of studies offered in these Universities.	PPT, Video	1102.3	Quizzes, 1st Sessional, End Term Examination
10	Probable Reasons for oblivion	To know about the probable reasons that led to the decline/fall of Indian education system.	Discussion	1102.3	Quizzes, 1st Sessional, End Term Examination
11	Contribution of India in the field of mathematics- 1	Significant contributions and achievements of ancient Indian mathematicians in comparison to the rest of the world.	Videos, PPTs	1102.2	Quizzes, 2 Sessional, End Term Examination
12	Contribution of India in the field of mathematics- 2	Significant contributions and achievements of ancient Indian mathematicians in comparison to the rest of the world.	Discussion	1102.2	Quizzes, 2 Sessional, End Term Examination
13	Contribution of India in the field of Astronomy- 1	Significant contributions and achievements of ancient Indian in the field of astronomy.	Videos, PPTs	1102.1	Quizzes, 2 Sessional, End Term Examination
14	Contribution of India in the field of Astronomy- 2	Significant contributions and achievements of ancient Indian in the field of astronomy.	Discussion	1102.1	Quizzes, 2 Sessional, End Term Examination

15	Contribution of India in the field of Architecture- 1	To look into the architectural heritage of India.	Videos and PPTs	1102.2	Quizzes, 2 Sessional, End Term Examination
16	Contribution of India in the field of Architecture- 2	To look into the architectural heritage of India.	Discussion	1102.2	Quizzes, 2 Sessional, End Term Examination
17	Contribution of India in the field of Metallurgy- 1	Significant contributions and achievements of ancient Indian metallurgists in comparison to the rest of the world.	Lecture	1102.1	Quizzes, 2 Sessional, End Term Examination
18	Contribution of India in the field of Metallurgy- 2, with special reference about Wootz steel.	A discussion on pioneering steel alloy matrix developed in India called Wootz steel and achievements of India in Zinc smelting by distillation process, first in the world	Lecture	1102.1	Quizzes, 2 Sessional, End Term Examination
19	Contribution of India in the field of Yoga and medicine- 1	Contribution of Indian scientists in plastic surgery and cataract surgery with reference to Sushruta Samhita, Jabamukhi Salaka etc.,	Lecture	1102.2	Quizzes, End Term Examination
20	Contribution of India in the field of Yoga and medicine- 2	Discussion on father of Indian medicine, Charkha and his contributions to ancient science of Ayurveda (Charakhasamhita)	Lecture	1102.2	Quizzes, End Term Examination
21	Indian Science & Technology in 20th Century- Major achievements	Major developments and achievements by indian scientists and researchers.	Lecture	1102.1, 1102.4	Quizzes, End Term Examination
22	Indian Science & Technology in 20th Century- Institutionalization of science	To understand the establishment of the scientific and technological institutes and the gradual proliferation of the scientific bodies and societies.	Lecture	1102.4	Quizzes, End Term Examination
23	Indian Science & Technology after Independence- Scientific internationalism and the Institute that Bhabha built	Understand the robust internationalism and mapping out colonial structures and institutional history of the Tata Institute of Fundamental Research.	Lecture	1102.4	Quizzes, End Term Examination
24	Indian Science & Technology after Independence- Biotechnology in India	Realising the adoption of modern biology and biotechnology including early phase	Lecture	1102.4	Quizzes, End Term Examination

		of Department of Biotechnology (DBT), established in 1986.			
25	Case Study- Jantar-Mantar (Jaipur)			1102.2	End Term Examination
				-----	--------

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	Correlation with Program Outcomes (POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
HS1102.1	Identify the contribution of India in the field of science and technology.	2	-	-	-	2	2	-	-	-	-	-	1
HS1102.2	Understand the contribution of ancient Indians in the field of science and technology.	2	-	-	-	2	1	-	-	-	-	-	-
HS1102.3	Analyse ancient Indian education system and reasons for its going into oblivion.	2	-	2	-	-	1	-	-	-	-	-	-
HS1102.4	Examine the growth of Indian science and technology in the 20th century A.D.	1	2	-	-	-	1	-	-	-	-	-	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Humanities and Social Sciences

DEPARTMENT OF LANGUAGES

Course Hand-out

TECHNCAL COMMUNICATION | EN1111 | 3 Credits | 2 1 0 3

Session: Jan 19 – May 19 | Faculty: Dr Richa Arora | Class: B. TECH. I YEAR

A. Introduction: This course is offered by Department of Languages as a compulsory course to the students of B.Tech in I and II Semester. The course offers in-depth knowledge of fundamental principles of effective communication skills. The course aims to develop critical and creative thinking abilities for communicative competence. It aims to organize and express ideas clearly in speech.

B. Course Outcomes: At the end of the course, students will be able to-

[1111.1] Review communication as a process with greater awareness

[1111.2] Display enhanced competence in oral and written communication

[1111.3] Use appropriate communication skills in specific contexts and for specific purposes

[1111.4] Demonstrate meaningful group communication exchanges

[1111.5] Frame questions to elicit the desired response and respond appropriately to questions which will lead them towards employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Demonstrate and apply knowledge of Mathematics, Science, and Engineering to classical and recent problems of electronic design & communication system.

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of solutions**: Design a component, system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Communication and Communication Skills (LSRW)- Definition, Process, Features, Types, Barriers, Verbal and Non-verbal communication, General and Technical communication; **Applied Grammar and Usage-** Subject-Verb

agreement, Common errors and misappropriations in English, Voice, Determiners, Modals, Jumbled up sentences; **Listening Comprehension**- Hearing and Listening, Types of Listening, Barriers to effective listening, Comprehending conversations and lectures. Role of pronunciation, accent, intonation and voice modulation; **Reading Comprehension**- Skimming and Scanning, Lexical and contextual meaning, Advanced Vocabulary; **Writing Skills**- Précis, Technical reports, Formal letters and Emails, Job Applications - Resumes and Covering Letters, Content writing (for brochures and websites), Bio-Sketch and Statement of Purpose (SoP); **Using Communication Effectively-** Presentations, Group Discussions and Mock interviews; **Case Studies on Communication** (Two/Semester)

F. Reference Books

1. C Tickoo and J Sasikumar. *Writing with a Purpose.* New Delhi: Oxford University Press, 2000.
2. D Green. *Contemporary English Grammar, Structures and Composition*. Delhi: Macmillan Publications, 2000.
3. D Jones. *English Pronouncing Dictionary*. London: ELBS, 2003.
4. L Bauer. *An Introduction to International Varieties of English*. Edinburgh: Edinburgh University Press, 2002.
5. M M McCarthy. *English Idioms in Use*. London: Cambridge University Press, 2002.
6. M Raman and S Sharma. *Technical Communication: Principles and Practice 2/e*. New Delhi: Oxford University Press, 2013.
7. N D Burton and J B Heaton. *Longman Dictionary of Common Errors*. Harlow: Longman, 1998.
8. N Ezekiel. *Collected Poems*. New Delhi: OUP, 2006.
9. N Krishnaswamy. *Modern English: A Book of Grammar Usage and Composition*. Delhi: Macmillan India, 2000.
10. R Parthasarthy (ed.). *Ten Twentieth Century Indian Poets*. New Delhi: OUP, 2009.
11. S Mishra and C Muralikrishna. *Communication Skills for Engineers*. New Delhi: Pearson Education, 2010.

F. Lecture Plan:

DAY	TOPICS	Programme objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
Day 1	Introduction to Communication Skills- LSRW; Definition and process of Communication	Communicate Effectively & Life long learning	Lecture, PPT, Discussion	1111.1	Quizzes, 2 Sessional, End Term Examination
Day 2	Types of Communication features of Communication;	Communicate Effectively& Lifelong learning	Lecture, PPT, Discussion	1111.1	Quizzes, 2 Sessional, End Term Examination
Day 3	Barriers to Communication	Communicate Effectively& Lifelong learning	Lecture, PPT, Discussion	1111.1	Quizzes, 2 Sessional, End Term Examination
Day 4	Verbal and Non-verbal communication	Communicate Effectively& Lifelong learning	Lecture, PPT, Discussion	1111.1	Quizzes, 2 Sessional, End Term Examination
Day 5-6	Difference between General and Technical communication; Revision and Recapitulation of Communication Theory with practical specimens	Communicate Effectively& Lifelong learning	Lecture, PPT, Discussion and problem solving	1111.3	Quizzes, 2 Sessional, End Term Examination

Day 6	Introduction to the basics of English Grammar; Subject-Verb Agreement	Communicate Effectively& Lifelong learning	Lecture, PPT,	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 7	Common errors and misappropriations in English	Communicate Effectively& Lifelong learning	Lecture	1111.4	Quizzes, 2 Sessional, End Term Examination
Day 8	Change of Voice	Communicate Effectively& Lifelong learning	Lecture, PPT, Discussion, Exercise	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 9	Determiners and Modals	Communicate Effectively& Lifelong learning	Lecture, PPT, Exercise	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 10-12	Jumbled up sentences and Grammar Practice	Communicate Effectively& Lifelong learning	Lecture, PPT, Exercise	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 13	Distinction between hearing and listening; Types of Listening	Communicate Effectively& Lifelong learning	Exercise	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 14	Barriers to effective listening	Communicate Effectively& Lifelong learning	Lecture, PPT, Exercise with audio files	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 15	Skills to comprehend conversations and lectures	Communicate Effectively& Lifelong learning	Lecture, PPT, Discussion	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 16-18	Role of pronunciation, accent, intonation and voice modulation	Communicate Effectively& Lifelong learning	Videos	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 19-20	Practical specimens of correct pronunciation, accent, intonation and voice modulation	Communicate Effectively& Lifelong learning	Practice with video files	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 21	Reading Comprehension- An Introduction	Communicate Effectively& Lifelong learning	Lecture, PPT	1111.2,	Quizzes, 2 Sessional, End Term Examination
Day 22	Skimming and Scanning for Reading Comprehension	Communicate Effectively&	Lecture, PPT, Practice with texts	1111.2	Quizzes, 2 Sessional, End

		Lifelong learning			Term Examination
Day 23-24	Lexical and Contextual Meaning in Reading Comprehension	Communicate Effectively& Lifelong learning	Lecture, PPT, practice with texts	1111.2	Quizzes, 2 Sessional, End Term Examination
Day 25	Learning Advanced Vocabulary	Communicate Effectively& Lifelong learning	Worksheet & Exercise	1111.3,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 26	Learning profession specific advance vocabulary	Communicate Effectively& Lifelong learning	Worksheet & Exercise	1111.3,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 27	Introduction to Writing Skills	Communicate Effectively& Lifelong learning	Lecture, PPT,	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 28-29	Précis writing- Theory and practice	Communicate Effectively& Lifelong learning	Lecture, PPT, Exercise	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 30-31	Writing of Technical Reports- Theory	Communicate Effectively& Lifelong learning	Lecture, PPT,	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 32	Formal letter writing- Basics and Practice	Communicate Effectively& Lifelong learning	Lecture, PPT, Home Assignments	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 33	Email Writing- Theory, Practice and etiquette	Communicate Effectively& Lifelong learning	Lecture, PPT, GD	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 34	Resume writing- Theory and Practice	Communicate Effectively& Lifelong learning	Lecture, PPT, Exercise	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 35	Job application & Cover letters- Practice	Communicate Effectively& Lifelong learning	Lecture, Exercise	1111.5	Quizzes, 2 Sessional, End Term Examination
Day 36	Content writing for brochures and websites; Writing Biographical Sketch; Writing Statement of Purpose	Communicate Effectively& Lifelong learning	Lecture, PPT, Exercise	1111.3,1111.5	Quizzes, 2 Sessional, End Term Examination

Day 37	Group Discussion- Theory and Types; Practice	Communicate Effectively& Lifelong learning	Exercise	1111.2,1111.4	Quizzes, 2 Sessional, End Term Examination
Day 38-39	Interview Types, Questions and Etiquettes; Mock Interviews	Communicate Effectively& Lifelong learning	PPT, GD	1111.3	Quizzes, 2 Sessional, End Term Examination
Day 40	Analysing Case Study and its Practice	contextual knowledge to assess societal, health, safety, legal, and cultural issues	PPT, GD	1111.2	Quizzes, 2 Sessional, End Term Examination
Day 41	PowerPoint Presentations	Communicate Effectively	PPT, GD	1111.2	Quizzes, 2 Sessional, End Term Examination
Day 42	PowerPoint Presentations	Communicate Effectively	PPT, GD	1111.2	Quizzes, 2 Sessional, End Term Examination

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	Correlation with Program Outcomes (POs)												Correlation with Program Specific Outcomes (PSOs)		
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
[1111.1]	**Review communication as a process with greater awareness**	**2**	**3**							**1**	**1**					
[1111.2]	**Display enhanced competence in oral and written communication**									**3**	**3**					
[1111.3]	**Use appropriate communication skills in specific contexts and for specific purposes**		**3**					**2**		**3**	**3**					
[1111.4]	**Demonstrate meaningful group communication exchanges**								**1**	**3**	**2**	**2**				
[1111.5]	**Write well organized self-introduction, CV, Resume etc. as required in profession**			**1**									**3**			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Mathematics & Statistics
Course Hand-Out

ENGINEERING MATHEMATICS-III | MA1308 | 3 Credits | 3 0 0 3

Session: July. 18 – Dec 18 | Faculty: **Dr. Laxmi Poonia** | Class: B. Tech. III Sem.

A. Introduction:-

This course is offered by Department of Mathematics and Statistics. The use of Engineering Maths-3 is indispensable in modern world. It is applicable to every discipline, be it physical sciences, engineering and technology. Much of the advanced research in electronics, electrical, computer science, industrial engineering, biology, genetics, and information science relies increasingly on use of mathematics tools. It is essential for the students to get acquainted with the subject of mathematics at an early stage. The present course has been designed to introduce the subject to undergraduate students in science and engineering. The course contains a good introduction to each topic and an advance treatment of theory at a fairly understandable level to the students at this stage. Each concept has been explained through examples and application oriented problems.

B. Course Outcomes: At the end of the course, students will be able to

MA1308.1 Understand the concept Vector calculus.
MA1308.2 Understand conceptual theory Laplace transform.
MA1308.3 Understand conceptual theory Fourier series and transform.
MA1308.4 Understand conceptual theory of Probability distribution.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:-

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS:-

Vector Calculus: gradient, divergence and curl, vector integrals, related theorems

Laplace Transforms: Transforms of elementary functions, inverse transforms, convolution theorem. Application of Laplace in solutions of differential equations with constant coefficients.

Fourier series: Fourier series, Dirichlet's, even and odd functions, half range series, change of interval, harmonic analysis.

Fourier Transforms: Fourier integrals, Complex Fourier transform, Fourier sine and cosine transforms, solution of heat and wave equations.

Probability and Statistics: Probability, distribution – Binomial, Poisson, Normal,

Text Books:

B. TEXT BOOKS:-

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Eastern, 2006.

C. REFERENCE BOOKS:-

1. Srimanta Pal, Subhdh C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
2. Babu Ram, "Engineering Mathematics", Vol. I & II, Pearson, 2012.

D. Lecture Plan:-

S.No.	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of assessing the outcome
		Laplace Transform:			
1	Introduction and Course Hand-out briefing : Definition of LT. LT of elementary functions.	Understanding the basics of Integral Transform & Laplace Transform	Lecture	MA1308.1	MTE-I Assignment & Quiz Test ETE
2-4	Properties of LT: linearity, First shifting, second shifting, change of scale, Multiplication by t, division by t, Derivative property, Integral Property ,Initial Value Problem, Final Value Problem (Without Proof)	Describe various properties of Laplace Transform	Lecture	MA1308.1	MTE-I Assignment & Quiz Test ETE
5-6	Inverse transforms, convolution theorem.	Discuss Inverse laplace Transform with theorems	Lecture	MA1308.1	MTE-I Assignment & Quiz Test ETE
7	Application of Laplace in solutions of differential equations with constant coefficients.	Application of Laplace Transform in solving differential equations	Lecture	MA1308.1	MTE-I Assignment & Quiz Test ETE
		Probability and Statistics			
8	Introduction of Probability	Describe Probability , Conditional Probability	Lecture	MA1308.2	MTE-I Assignment & Quiz Test ETE
9-10	Bay's Theorem	Describe Bay's theorem statement, proof and questions	Lecture	MA1308.2	MTE-I Assignment & Quiz Test ETE

11-12	Distributions: discrete, continuous, pdf, pmf	Describe Binomial distribution	Lecture	MA1308.2	MTE-II Assignment & Quiz Test ETE
13-14	Poisson distribution	Discuss Poisson distribution	Lecture	MA1308.2	MTE-II Assignment & Quiz Test ETE
15-17	Normal distribution	Describe Normal distribution	Lecture	MA1308.2	MTE-II Assignment & Quiz Test ETE
Vector Calculus:					
18-20	gradient, divergence and curl	Describe Basics of Vector calculus	Lecture	MA1308.3	MTE-II Assignment & Quiz Test ETE
21-23	vector integrals	Describe Vector integrals	Lecture	MA1308.3	MTE-II Assignment & Quiz Test ETE
24-27	Greens, Stokes and Gauss Divergence theorem	Discuss various theorems of vector calculus and their properties	Lecture	MA1308.3	MTE-II Assignment & Quiz Test ETE
Fourier series:					
28-29	Fourier series, Dirichlet Condition	Explain properties and basics of fourier Series	Lecture	MA1308.4	MTE-II Assignment & Quiz Test ETE
30	even and odd functions half range series	Describe series of even and odd functions	Lecture	MA1308.4	MTE-II Assignment & Quiz Test ETE
31	change of interval	Describe fourier series for change of interval	Lecture	MA1308.4	ETE Assignment & Quiz Test
32-33	Harmonic analysis	Describe Harmonic analysis	Lecture	MA1308.4	ETE Assignment & Quiz Test
Fourier Transforms:					
34	Fourier integrals	Describe basics of Fourier Transform and fourier integrals	Lecture	MA1308.5	ETE Assignment & Quiz Test
35-36	Complex Fourier transform, Fourier sine and cosine transforms,	Describe Fourier sine & cosine transform	Lecture	MA1308.5	ETE Assignment & Quiz Test
37-38	Properties of Fourier Transform	Describe Properties of Fourier Transform	Lecture	MA1308.5	ETE Assignment & Quiz Test
39-40	solution of heat and wave equations	Describe Application of Fourier Transform	Lecture	MA1308.5	ETE Assignment & Quiz Test
END SEMESTER EXAMINATION					

E. Course Articulation Matrix: (Mapping of COs with POs and PSOs):-

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOME												CORRELATION WITH PROGRAM SPECIFIC OUTCOME			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MA1308.1	Understand the concept Vector calculus.	3	2	2	1	1	1	2	1			1	1	2	2	2	
MA1308.2	Understand conceptual theory Laplace transform.	3	3	2	3	3	2	1	1			1	1	2	2	2	
MA1308.3	Understand conceptual theory Fourier series and transform.	3	2	3	3	3	1		1	2	3	1	1	2		1	3
MA1308.4	Understand conceptual theory of Probability distribution .	3	2	2	2	2	2			2	2		1		1	1	2

1-

1:-Low Correlation; 2:-Moderate Correlation; 3:- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering
Department of Civil Engineering
Course Hand-out
Fluid Mechanics-I |CV1301| 4 Credits | 3 1 0 4
Session: July, 2018 – Dec.2018 | Faculty: Dr. Parwez M. Akhtar | Class: 3rd Semester B.Tech(Civil)

A. INTRODUCTION: This course is offered by Dept. of Civil Engineering as an 3rd semester course, targeting students who want to pursue a career particularly in the broad domain of hydraulics, water and water resources related technology and management and to extent for those who intends to pursue higher studies in the field of fluid dynamics related sciences and engineering, such as river mechanics, computational hydraulics, environment and eco-hydraulics, water supply and waste water distribution network and quality management etc. This is a beginners as well as preliminary course as such only fundamentals of fluid properties and behaviour aspects with a goal of developing a systematic report on the Applied Engineering Fluid Mechanics is taught. Understanding of fundamentals mass-momentum conservation, fluid statics, fluid kinematics are in general basic components of the course. This course is fundamentally multi-disciplinary engineering course, as such participating students are expected to have a strong background knowledge of basics sciences such as physics and applied mathematics.

B. COURSE OUTCOMES: At the end of the course, students will be able to:

[CV1301.1]. Understand the basic concept, historical context and wider importance of theoretical fluid mechanics including preliminary analysis of fluid inertial behaviour and enhance employment.

[CV1301.2]. Understand kinematics of fluid motion through knowledge of mathematics/science/fundamentals and solution of complex engineering problems. Critical review and analysis

[CV1301.3]. Understand and be able to solve fluid dynamics problems through knowledge of mathematics/science/fundamentals and solution of complex engineering problems.

[CV1301.4]. Overview of preliminary flow measurement apparatus and dissemination of preliminary model similarities covering design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[CV1301.5]. Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation and individual and group work and be trained to be able to pursue advance courses in related fields to promote entrepreneurship.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. PROBLEM ANALYSIS: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including preliminary prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes + Assignments (Tutorials) + Class Project	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked **blank**, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will	

	be awarded.

E. SYLLABUS

Introduction: Overview and scope of the subject, Fluid properties, ideal and real fluids, fluid pressure and its measurement using manometers. Hydrostatic: Forces on plane surface and curved surfaces, centre of pressure; stability of floating and submerged bodies. Kinematic of fluid motion: Lagrangian and Eulerian approach, classification of flows- one, two and three dimensional, steady, unsteady, uniform and non –uniform, laminar and turbulent, streamline, path line, streak line and stream tube, continuity equation, tangential and normal acceleration, velocity and stream functions , rotational and irrotational flows and flow net. Dynamics of fluid motion: Euler's equation of motion, Bernoulli's equation, and its applications, venturimeter, orifice meter and Pitot tube. Momentum equation and its application on stationary and moving vanes. Flow through pipes: Ideal fluid flow: Renolds' experiment, laminar and turbulent flow through pipes- velocity distribution, head loss, Darcy- Weisbach's equation, pipes in series and parallel. Velocity distribution in laminar flow and turbulent flow, Flow measurement: Orifices, mouthpieces, notches and weirs, sluice gate, time of emptying and filling of tanks through orifices. Dimensional Analysis: Dimensional parameters and their significance, Buckingham's Pi theorem and model similarities.

F. TEXT BOOKS

1. Garde R.J. and Mirajgaokar A.G., Engineering Fluid Mechanics (Including Hydraulic Machines), Nem Chand & Bros, Roorkee, Second Edn, 1983.
2. Modi P.N. & Seth. S.M., Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2005.
3. Subramanya K., Theory and Applications of Fluid Mechanics (Including Hydraulic Machines), Tata McGraw- Hill Publishing Company Limited, New Delhi, 2011.
4. Jain A.K., Fluid Mechanics Including Hydraulic Machines, Khanna Publishers, Delhi, 2004.

G. REFERENCE BOOKS

1. Çengel Yunus A. and Cimbala John M., Fluid Mechanics Fundamentals and Applications Tata McGraw Hill Education Pvt. Limited New Delhi, 2011
2. Pritchard Philip J. and Leylegian John C., Fluid Mechanics, Wiley India Ltd. New Delhi, 2012

H. LECTURE PLAN:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1, 2	Introduction and fundamental of FM	Scope of Fluid Mechanics : Understand the basic concept	Lecture/Class Quiz	CVCV1301.1, CVCV1301.5	In Class Quiz
3	Introduction and fundamental of FM	Historical context and wider importance of theoretical fluid mechanics	Lecture/Class Quiz	CV1301.1, CV1301.5	In Class Quiz

4,5	Introduction and fundamental of FM	Preliminary analysis of fluid inertial behaviour and fluid properties.	Lecture/Class Quiz	CV1301.1, CV1301.5	In Class Quiz End Term
6	Introduction and fundamental of FM	Pressure Measurement using Manometer	Lecture/Class Quiz	CV1301.1	1st Sessional ET Exam Home Assignment In class quiz
7,8	Hydrostatics	Understand Basic Concept of Hydrostatics, Forces on plane surface and curved plane	Lecture/Class Quiz	CV1301.1	
9, 10	Hydrostatics	Centre of pressures	Lecture/Class Quiz	CV1301.1	
11,12	Hydrostatics	Stability of floating and submerged bodies.	Lecture/Class Quiz	CV1301.1	1st Sessional ET Exam Home Assignment In class quiz
13	Kinematics of fluid motion	Lagrangian and Eulerian Approach	Lecture/Class Quiz	CV1301.2, CV1301.5	
14	Kinematics of fluid motion	steady/unsteady flows	Lecture/Class Quiz	CV1301.2	
15	Kinematics of fluid motion	Uniform and Non uniform flows	Lecture/Class Quiz	CV1301.2	1st Sessional ET Exam Home Assignment In class quiz
16, 17	Kinematics of fluid motion	Turbulent and streamlines streaklines and stream tubes	Lecture/Class Quiz	CV1301.2	
18	Kinematics of fluid motion	Continuity Equation	Lecture/Class Quiz	CV1301.2	
19, 20	Kinematics of fluid motion	Tangential and normal accelerations	Lecture/Class Quiz	CV1301.2	1st Sessional ET Exam Home Assignment In class quiz
21, 22	Kinematics of fluid motion	Velocity and stream functions	Lecture/Class Quiz	CV1301.2	
23, 24	Kinematics of fluid motion	Rotational and irrotational flows	Lecture/Class Quiz	CV1301.2	
25	Kinematics of fluid motion	Flownets and related problems	Lecture/Class Quiz	CV1301.2	1st Sessional ET Exam Home Assignment
1ndSessional Examination					
26	Dynamics of fluid motion	Euler's Equation of motion	Lecture/Class Quiz	CV1301.3	2nd Sessional ET Exam Home In class quiz
27,28	Dynamics of fluid motion	Bernoulli's equation and its application	Lecture/Class Quiz	CV1301.3, CV1301.5	
29	Dynamics of fluid motion	Venturimeter and orifice meter/pitot tube	Lecture/Class Quiz	CV1301.3	2nd Sessional ET Exam Home In class quiz

30, 31	Dynamics of fluid motion	Momentum equation and its application on stationary and moving vanes.	Lecture/Class Quiz	CV1301.3	2nd Sessional ET Exam Home In class quiz
32, 33	Dynamics of fluid motion	Flow through pipes-: Ideal fluid flow: Reynold's Experiment Cont.	Lecture/Class Quiz	CV1301.3	2nd Sessional ET Exam Home In class quiz
34, 35	Dynamics of fluid motion	Laminar and turbulent flow through pipes-velocity distribution and head loss	Lecture/Class Quiz	CV1301.3	2nd Sessional ET Exam Home In class quiz
2ndSessional Examination					
36	Dynamics of fluid motion	Darcy-Weisbach's equation and its application	Lecture/Class Quiz	CV1301.3	ET Exam Home Assignment In class quiz
37, 38	Dynamics of fluid motion	Pipes in series and parallel with examples	Lecture/Class Quiz	CV1301.3	ET Exam Home Assignment In class quiz
39, 40	Dynamics of fluid motion	Velocity distribution in laminar and turbulent flows	Lecture/Class Quiz	CV1301.3	ET Exam Home Assignment In class quiz
41, 42	Flow measurement	Orifice and mouth pieces	Lecture/Class Quiz	CV1301.4	ET Exam Home Assignment In class quiz
43, 44	Flow measurement	Notches, weirs and sluice gates	Lecture/Class Quiz	CV1301.4	ET Exam Home Assignment In class quiz
45	Flow measurement	Time of filling and emptying of tanks through orifice	Lecture/Class Quiz	CV1301.4	ET Exam Home Assignment In class quiz
46	Dimensional analysis	Dimensional parameters and its significance	Lecture/Class Quiz	CV1301.4, CV1301.5	ET Exam In class quiz
47, 48	Dimensional analysis	Buckingham 's Pi (π) theorem and model similarities	Lecture/Class Quiz	CV1301.4	ET Exam In class quiz
END TERM EXAM					

I. COURSE ARTICULATION MATRIX: (MAPPING OF COS WITH POS)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CV1301.1	Understand the basic concept, historical context and wider importance of theoretical fluid mechanics including preliminary analysis of fluid inertial behaviour and enhance employment. .	3	0	1	0	0	1	0	0	0	0	0	3	2	0	0	2
CV1301.2	Understand kinematics of fluid motion through knowledge of mathematics/science/fundamentals and solution of complex engineering problems. Critical review and analysis	0	3	0	2	1	0	2	0	0	1	0	0	0	2	0	0
CV1301.3	Understand and be able to solve fluid dynamics problems through knowledge of mathematics/science/fundamentals and solution of complex engineering problems.	1	0	3	0	0	0	1	0	0	2	0	3	0	2	0	1
CV1301.4	Overview of preliminary flow measurement apparatus and dissemination of preliminary model similarities covering design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions	3	0	1	0	2	0	0	3	0	1	0	0	0	0	1	0
CV1301.5	Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation and individual and group work and be trained to be able to pursue advance courses in related fields to promote entrepreneurship.	2	0	0	2	0	3	0	0	0	0	1	3	1	0	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-Out

Building Science and Technology | CV1302| 3 Credits | 3 0 0 3

Session: Jul 18-Nov 18 | Faculty: Gaurav Sancheti| Class: B.Tech Civil III SEM

A. Introduction: This course is offered by Dept. of Civil Engineering for third semester students. The subject offers a basic understanding of different types of construction materials which will include both, conventional and modern building materials. Course work includes introduction to various types of building components such as foundations, walls and roofs and the ways to maintain and protect them. In this coursework, students will be trained for various types of brick bonds in masonry construction. Also they will develop skill for testing various building materials such as Lime, cement, aggregate, concrete, timber, bricks, tiles, etc. as per Indian Standards guidelines. The course will include activities, such as assignments, quizzes, class tests, site visits, projects, focusing on the knowledge of students for lifelong learning and making them employable.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1302.1]. Identify various type of building materials and apply his engineering skills to investigate them for their suitability in sustainable construction works for safe and ethical professional engineering practice.

[CV1302.2]. Take critical engineering decisions on the type of building components and appropriate/modern construction techniques to be used to justify the suitability and economy of the project

[CV1302.3]. Communicate effectively with society/engineering community for all sort of maintenance issues of a building and give/develop specific scientific solutions in the broadest context of technological advancements

[CV1302.4]. Work independently or in a group as a consultant for material design and testing as per the guidelines of Indian Standard codes, which can increase employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Plastering, Painting and Flooring: Types, properties, White washing, Colour washing and distempering of walls. Plastic emulsion, Enamel and powder Coat painting of walls, Painting of wood and metal works, Granolithic, Concrete, Mosaic, Ceramic, Marble, Terrazzo and Synthetic material flooring, Roofs: Sloped roofs – Leaning roofs, Coupled and Collared roofs; Timber trusses: King post and Queen post trusses; Shoring, Underpinning, and Scaffolding. Bricks & Tiles; Lime: Types and their application; Timber: properties, defects and preservation, Types and uses; Tar, Bitumen and Asphalt, Modern Building Materials: Plastic, FRP, rubber, glass, Ferro-cement, glass, ceramics and paints; Corrosion: types and Corrosion prevention methods; Cements: Types, composition, properties and uses, physical tests on cement, Concrete Technology: Ingredients of concrete, properties & tests on fresh and hardened concrete as per IS codes. Foundation: Types of foundation, spread foundations, pile foundations, pier foundations, excavation of foundation. Centring, Shuttering & Scaffolding: Types, methods and material used. Types of Walls: Purpose and

method of construction. Brick Masonry: Terminology, Materials used, Causes of failure of brick masonry, Types of bonds, Brick laying, Reinforced brickwork. Stone Masonry: Terminology used, Materials used, Cutting and dressing of stones, Types of stone masonry-Rubble and Ashlar, Joints of stone, Stone lining, maintenance of stone work, Artificial stones. Damp Proofing: material used for damp proofing, methods of preventing dampness. Maintenance of Buildings: Types and corrosion prevent method, Causes and prevention of cracks in building, special repair of buildings, annual maintenance.

F. TEXT BOOKS

1. *Punmia B.C., Building Construction, Lakshmi Publications, New Delhi, 2008.*

G. REFERENCE BOOKS

2. *SP 20, Handbook on Masonry Design and Construction, B.I.S. Publication, 1991.*
3. *SP 62 (S&T), Handbook on Building Construction Practices, B.I.S. Publication, 1997.*
4. *Neville A. M, Properties of Concrete, McGraw-Hill, Singapore, 2012.*
5. *S.K.Duggal, Building Materials, TMH Publication, 2010*
6. *Rangwala, Engineering Materials, Charotar Publication, 2014*

H. Lecture Plan:

Class No.	Topics	Session Outcome	Mode of Delivery	Corresponding outcome	Mode of Assessing the Outcome
(A)	**Building Materials:**				
1.	Lime: Types and their application;	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
2.	Timber: Properties, defects	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
3.	Preservation, Types and uses	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
4.	Bricks & Tiles	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
5.	Tar, Bitumen and Asphalt	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
	Activity1: Online Class Quiz-1, Activity2: Laboratory visits for identification of building materials				
	Assignment: Based on Lectures 1 to 5				
6.	Cements: Types, composition, properties and uses,	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
7.	Physical tests on cement	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam

8.	Concrete: Ingredients of concrete, properties	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
9.	Tests on fresh and hardened concrete as per IS codes.	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
10.	Tests on fresh and hardened concrete as per IS codes.	Basic idea of Civil Engineering materials	Lecture	CV1302.1	Quiz, Exam
(B)	**Modern Building Materials:**				
11.	Plastic, FRP, rubber, glass,	Advance materials in civil engineering	Lecture	CV1302.2	Quiz, Exam
12.	Ferro-cement, glass, ceramics and paints;	Advance materials in civil engineering	Lecture	CV1302.2	Quiz, Exam
(C)	**Centering, Shuttering & Scaffolding:**				
13.	Types, methods and material used,	Learning of construction practices	Lecture	CV1302.2	Quiz, Exam
14.	Shoring, Underpinning, and Scaffolding	Learning of construction practices	Lecture	CV1302.2	Quiz, Exam
	Activity2: Online Class Quiz-2				
	Assignment: Based on Lectures 6 to 14				
(D)	**Foundation:**				
15.	Type of foundations, Spread foundations, Pile foundations,	Learning about different type of foundation	Lecture	CV1302.2	Quiz, Exam
16.	Pier foundations,	Learning about different type of foundation	Lecture	CV1302.2	Quiz, Exam
17.	Excavation of foundation.	Learning about different type of foundation	Lecture	CV1302.2	Quiz, Exam
(E)	**Damp Proofing:**				
18.	Materials used for damp proofing,	Damp Proofing	Lecture	CV1302.2	Quiz, Exam
19.	Methods of preventing dampness.	Damp Proofing	Lecture	CV1302.2	Quiz, Exam
(F)	**Brick Masonry:**				
20.	Terminology, Materials used,	Basic idea of brick masonry	Lab	CV1302.3	Quiz, Exam
21.	Causes of failure of brick masonry,	Basic idea of brick masonry	Lab	CV1302.3	Quiz, Exam
22.	Types of bonds, Brick laying, Reinforced brickwork.	Basic idea of brick masonry	Lab	CV1302.3	Quiz, Exam
	Activity3: Online Class Quiz-3				
	Assignment: Based on Lectures 15 to 22				
(G)	**Stone Masonry:**				
23.	Terminology used, Materials used, Cutting and dressing of stones,	Basic idea of stone masonry	Lecture	CV1302.1	Quiz, Exam
24.	Types of stone masonry-Rubble and Ashlar, Joints of stone,	Basic idea of stone masonry	Lecture	CV1302.1	Quiz, Exam
25.	Stone lining, maintenance of stone work, Artificial stones	Basic idea of stone masonry	Lecture	CV1302.1	Quiz, Exam
(H)	**Types of Walls:**				
26.	Purpose and method of construction	`	Lecture	CV1302.1	Quiz, Exam

(I)	**Plastering, Painting and Flooring:**				
27.	Types, properties, White washing,	Learning about construction material	Lecture	CV1302.1	Quiz, Exam
28.	Color washing and distempering of walls	Learning about construction material	Lecture	CV1302.1	Quiz, Exam
29.	Plastic emulsion, Enamel and powder Coat painting of walls,	Learning about construction material	Lecture	CV1302.1	Quiz, Exam
30.	Painting of wood and metal works,	Learning about construction material	Lecture	CV1302.1	Quiz, Exam
31.	Granolithic, Concrete, Mosaic, material flooring,	Learning about construction material	Lecture	CV1302.1	Quiz, Exam
32.	Ceramic, Marble, Terrazzo and Synthetic material flooring,	Learning about construction material	Lecture	CV1302.1	Quiz, Exam
(J)	**Roofs:**				
33.	Sloped roofs – Leaning roofs, Coupled and Collared roofs;	Learning about different type of roofs	Lecture	CV1302.2	Quiz, Exam
34.	Timber trusses: King post and Queen post trusses;	Learning about different type of roofs	Lecture	CV1302.2	Quiz, Exam
	Activity4: Online Class Quiz-4				
	Assignment: Based on Lectures 23 to 34				
(K)	**Maintenance of Buildings:**				
35.	Corrosion: Types and corrosion prevent method,	Learning about maintenance practices	Discussion	CV1302.4	Quiz, Exam
36.	Causes and prevention of cracks in building,	Learning about maintenance practices	Discussion	CV1302.4	Quiz, Exam
37.	Special repair of buildings,	Learning about maintenance practices	Discussion	CV1302.4	Quiz, Exam
38.	Annual maintenance	Learning about maintenance practices	Discussio	CV1302.4	Quiz, Exam
	Activity5: Presentation on Project and Report Submission				
(L)	**Revision/Class Test:**				
39.	Revision	Revision	Discussion	CV1302.1, CV1302.2, CV1302.3, CV1302.4	NA
40.	Revision	Revision	Discussion	CV1302.1, CV1302.2, CV1302.3, CV1302.4	NA

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	
CV1302.1	Identify various type of building materials and apply his engineering knowledge to investigate them for their suitability in sustainable construction works for safe and ethical professional engineering practice.	3	2	2	1	1	1	2	1			1	1	2	2	2		
CV1302.2	Take critical engineering decisions on the type of building components and appropriate/modern construction techniques to be used to justify the suitability and economy of the project	3	3	2	3	3	2	1	1			1	1	2	2	2		
CV1302.3	Communicate effectively with society/engineering community for all sort of maintenance issues of a building and give/develop specific scientific solutions in the broadest context of technological advancements	3	2	3	3	3	1		1	2	3	1	1	2		1	3	
CV1302.4	Work independently or in a group as a consultant for material design and testing as per the guidelines of Indian Standard codes, hence developing the ability to engage in independent and life-long learning.	3	2	2	2	2	2			2	2		1		1	1	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Surveying | CV1303| 4 Credits | 4 0 0 4

Session: Jul 18-Nov 18 | Faculty: Alok Damare| Class: B.Tech Civil III SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental Core Course, it includes application of engineering mathematics and fundamental of physics. This course the build the capacity of the student in taking measurement on field, plot map/plan, set out work (i.e. building, tunnel, foundation etc.). Also offer them to work on advance instrument and software and deals with plane surveying and geodetic survey covering essential part of field.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1303.1]. Take measurement on the field.

[CV1303.2]. Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings

[CV1303.3]. Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.

[CV1303.4]. Make entry in field book.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Overview and scope of the subject, Principle of surveying-methods-plane and geodetic survey- Principle of Chain Surveying: Offsets, cross staff and principle of optical square- error in offsets- obstacle in chaining, Compass Survey- principle, prismatic compass, surveyor compass, bearing and included angles declination- local attraction- graphical adjustment of compass transverse-latitude and departures, Plane Table survey- method of computation of areas and volumes, areas calculation, volume calculation, Levelling - introduction- simple levelling-differential levelling- errors in levelling-curvature and refraction- sensitiveness of bubble tube-cross sectioning, profile and reciprocal levelling. Contours: Introduction- application and uses-method-characteristics of planimeter, Theodolite Survey: introduction and description of theodolite-repetition and reiteration- trigonometric levelling; Study of Minor Instrument: Hand level, abney level, electronic theodolite, Ceylon ghat tracer, Indian pattern clinometer, box sextant. Tachometry: Principles, methods, analytic tachometer, distance and elevation formulae; Curves: Introduction, simple curve, compound curve, reverse curve, transition curve, lemniscate curve, vertical curve. Triangulation and Theory of Errors, Electronic Distance Measurement.

F. TEXT BOOKS

1. Punmia B.C., Surveying and Leveling Vol. I and II, Lakshmi Publishers, New Delhi 2005.

REFERENCE BOOKS

1. Subramanian R., Surveying and Levelling, Oxford University Press 2012.
2. Subramanian R., "Surveying and Levelling", Oxford University Press 2012.
3. Chandra A.M., Plane Surveying, New Age International Pvt. Ltd., 2011
4. Punmia B.C., Surveying Vol. I and II, Lakshmi Publications, New Delhi, 2005

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1,2	Introduction	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Lecture	**CV1303.3**	NA
3	Introduction2	Methods of measurement on the field.	Lecture	**CV1303.2**	In Class Quiz
4,5	Linear Measurement 1	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Lecture	**CV1303.3**	In Class Quiz End Term
3	Linear Measurement 2	Take measurement on the field.	Lecture and field visit	**CV1303.1**	1st Sessional ET Exam Home Assignment
4	Linear Measurement 3	Error measurement	Lecture and field visit	**CV1303.2**	
5	Linear Measurement 4	Take measurement on the field.	Lecture	**CV1303.1**	
6	Chain Surveying 1	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Lecture	**CV1303.1**	1st Sessional ET Exam Home Assignment
7	Chain Surveying 2	Take measurement on the field.	Lecture and field visit	**CV1303.1**	
8	Chain Surveying 3	Error measurement	*tutorial*	**CV1303.2**	
9	Chain Surveying 4	Learn and understand working of basic and advance instrument	*Lecture*	**CV1303.1**	
10	Chain Surveying 5	Error measurement	*tutorial*	**CV1303.2**	

11	Chain Surveying 6	Error measurement	Lecture	**CV1303.2**	1st Sessional ET Exam Home Assignment
12	Compass Surveying 1	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Lecture	**CV1303.3**	
13	Compass Surveying 2	Error measurement	Lecture		
14	Compass Surveying 3	Error measurement	Lecture and field visit	**CV1303.2**	1st Sessional ET Exam Home Assignment
15	Compass Surveying 4	Take measurement on the field.	*tutorial*	**CV1303.1**	
16	Theodolite 1	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Lecture	**CV1303.3**	
17	Theodolite 2	Take measurement on the field.	Lecture	**CV1303.4**	1st Sessional ET Exam Home Assignment
18	Theodolite 3	Take measurement on the field.	Lecture	**CV1303.1**	
19	Levelling 1	Learn and understand working of basic and advance instrument to perform different exercises on the field.	Lecture	**CV1303.3**	
20	Levelling 2	Make entry in field book.	Lecture	**CV1303.4**	1st Sessional ET Exam Home Assignment
21	Levelling 3	Take measurement on the field.	Lecture and field visit	**CV1303.1**	
22	Levelling 4	Take measurement on the field.	*tutorial*	**CV1303.1**	
23	Levelling 5	Take measurement on the field.	Lecture	**CV1303.1**	

					1st Sessional ET Exam Home Assignment
24	Contouring 1	Make entry in field book.	Lecture	**CV1303.4**	
25	Contouring 2		Lecture and field visit	**CV1303.1**	
26	Plane Table 1	Make entry in field book.	*tutorial*	**CV1303.4**	2ndSessional ET Exam Home Assignment
27	Plane Table 2	Make entry in field book.	Lecture	**CV1303.4**	
28	Theory Of Errors 1	Take measurement on the field.	Lecture	**CV1303.1**	
29	Theory Of Errors 2	Make entry in field book.	Lecture and field visit	**CV1303.4**	2nd Sessional ET Exam Home Assignment
30	Traverse Computation And Adjustment 1	Take measurement on the field.	*tutorial*	**CV1303.1**	
31	Traverse Computation And Adjustment 2	Take measurement on the field.	*tutorial*	**CV1303.1**	
32	Measurement Of Area And Volume 1	Take measurement on the field.	Lecture	**CV1303.1**	2ndSessional ET Exam Home Assignment
33	Measurement Of Area And Volume 2	Error measurement	*tutorial*		
34	Circler Curve 1	Setting of circular curve	*tutorial*	**CV1303.1**	
35	Circler Curve 2	Setting of circular curve	Lecture	**CV1303.1**	2nd Sessional

					ET Exam Home Assignment
36	Transition Curve 1	Setting of circular curve	Lecture	**CV1303.1**	
37	Transition Curve 2	Take measurement on the field.	Lecture	**CV1303.1**	
38	Trigonometric Leveling 1	Take measurement on the field.	*tutorial*	**CV1303.**	2ndSessional ET Exam Home Assignment
39	Trigonometric Leveling 2	Take measurement on the field.	*tutorial*	**CV1303.1**	
40	Tachometric Surveying 1	Take measurement on the field.	Lecture	**CV1303.1**	
41	Tachometric Surveying 2	Take measurement on the field.	*tutorial*	**CV1303.1**	2nd Sessional ET Exam Home Assignment
SECOND SESSIONAL EXAM					
42	Triangulation 1	Learn and understand working of basic and advance instrument to perform different exercises on the field.	Lecture	**CV1303.3**	
43	Triangulation 2	Take measurement on the field.	*tutorial*	**CV1303.1**	
44	Photogrammetry 1	Learn and understand working of basic and advance instrument to perform different exercises on the field.	*tutorial*	**CV1303.3**	
45	Photogrammetry 2	Take measurement on the field.	Lecture	**CV1303.1**	
46	Remote Sensing	Learn and understand working of basic and advance instrument to perform different exercises on the field.	Lecture	**CV1303.3**	
47	GPS And GIS	Learn and understand working of basic and advance instrument to perform different exercises on the field.	Lecture	**CV1303.3**	
48	EDM	Learn and understand working of basic and advance instrument to perform different exercises on the field.	Lecture	**CV1303.3**	
END TERM EXAM					

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CV1303.1]	Take measurement on the field.	2			2	3	1		2	3	1				3	2	1
[CV1303.2]	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings		3	1	3										3		
[CV1303.3]	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.					3							2		3		2
[CV1303.4]	Make entry in field book.	3							3			2		3			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Engineering Geology| CV1304 | 4 Credits | 4 0 0 4

Session: July – December 2018 | Faculty: Dr Harshavardhana B G | Class: Regular

A. Introduction: This course is offered by Dept. of Civil Engineering as a Regular Course, targeting students, wishing to pursue research and development in Construction Industries or higher studies in field of Civil Engineering. This course is developed to study the origin and evolution of earth, rocks, minerals, geological structures, geomorphic features, causes and remedies of geological hazards. An emphasis has been given to understand and minimise the possible problems to the civil engineering structures, originating from the geological conditions. Students are expected to have the basic knowledge of Geology for a better learning.

B. Course Outcomes: At the end of the course, students will be able to

[CV1304.1]. Apply the fundamental knowledge of rocks, minerals, and geological structures while analysing / identifying and addressing the complex engineering problems when planning for building construction, which would enhance the employability.

[CV1304.2]. Discern different geological processes, causing a variety of rock structures that may be disastrous to public health and safety and help in developing suitable solutions to civil constructions.

[CV1304.3]. Apprehend the importance and application of geophysical instruments / techniques in engineering geology to design as well as construct a safe, strong, durable and economically sustainable engineering structures.

[CV1304.4]. Explore the impact of various geological structures on civil constructions. Students can demonstrate the knowledge by participating in class debates and presentations on various topics of environmental concern with effective communication for a better entrepreneurship.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Student who misses a class will have to report to the teacher about the absence. A makeup assignment (which will be considered only for attendance) on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments	

	with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

E. SYLLABUS

Introduction: Overview and scope of the subject, Geology and its role in Civil Engineering, Earth as a planet, its internal structure and composition.
Mineralogy: Description and identification of rock-forming minerals and Ores, their physical and special properties; Olivine, Augite, Hornblende, Mica group, Feldspar group, Quartz and its varieties. Carbonate group, Asbestos, Kaolin, Talc, Gypsum, Garnet, Corundum, Magnetite, Hematite, Limonite, Pyrite, Chalcopyrite, Galena and Bauxite.
Petrology: Definition, sources of rocks, classification of rocks based on mode of formation, rock-cycle. Identification and description. Igneous rocks: Granite, Syenite, Diorite, Gabbro, Dunite; Pegmatite, Porphiries, Dolerite; Rhyolite, Basalt and Pumice. Sedimentary rocks: Primary structures and description of Sandstones, Conglomerate, Breccia, Shale, Limestones and Laterite. Metamorphic rocks: Gneiss, Quartzite, Marble, Slate, Phyllite and Schists, Rock as building material.
Structural Geology: Definition, outcrop, dip and strike of a rock-bed, clinometer and compass. Folds, joints, faults, and unconformity, their recognition and importance in Civil Engineering field investigation.
Physical Geology: Weathering of rocks, types of weathering, agencies, causes and products of weathering. Origin and development of river systems, erosion, transportation and deposition by rivers, geological action of wind and its geomorphic features.
Hydrogeology: Hydrological cycle, distribution of ground water in the earth crust, types and properties of water bearing geological formation, selection of sites for well locations, techniques of ground water exploration, artificial recharge of groundwater methods, rain water harvesting. Sea water intrusion and remedial measures.
Geodynamics: Plate tectonics, earthquake, seismic waves, magnitude and intensity scales, earthquake-recording instruments, characteristics of strong ground motions and attenuation, earthquake occurrence in the world, seismic zoning map of India and its use. Tsunami and landslides, causes, effects and remedial measures.
Engineering Geology: Geological considerations in selection of sites for Dams, Reservoirs, Tunnels, Bridges and Highways.

F. TEXT BOOKS

1. Singh, P. (2013). Engineering and General Geology, Published by S. K. Kataria and Sons, New Delhi.
2. Mukherjee, P. K. (2005). A Text Book of Geology, World Press, Kolkata.
3. Reddy, D. V. (2012). Engineering Geology for Civil Engineering, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

G. REFERENCE BOOKS

1. Bell, F. G. (2007). Engineering Geology, Butterworth-Heinemann, 2nd Edition, 592 P.
2. Blyth, F. G. H. and de Freitas, M. H. (2006). Butterworth-Heinemann, 7th Edition, 325 P.

Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction to Geology and its role in Civil Engineering, Earth as a planet, its internal structure and composition.	Understanding the Basics of Geology for Civil Engineering	Lecture	CV1304.1	Quiz, MTE-I and ETE
2	Description and identification of rock-forming minerals and Ores.	Familiarization of mineral samples and their physical properties	Lecture with mineral hand-specimen for familiarization		
3	Physical and special properties of minerals.				
4	Physical and special properties of Olivine, Augite and Hornblende.				

5	Physical and special properties of Mica and Feldspar group of minerals.	Familiarization of mineral samples and their physical properties	Lecture with mineral hand-specimen for familiarization	CV1304.1	Quiz, MTE-I and ETE
6	Physical and special properties of Quartz and its varieties.			CV1304.1	
7	Physical and special properties of Carbonate group, Asbestos, Kaolin, Talc and Gypsum.				
8	Physical and special properties of Garnet, Corundum, Magnetite and Hematite.				
9	Physical and special properties of Limonite, Pyrite and Chalcopyrite.				
10	Physical and special properties of Pyrolusite and Psilomalane.				
11	Physical and special properties of Chromite, Galena and Bauxite				
12	Definition and sources of rocks.	Familiarization of different types of rocks samples and their properties	Lecture with rock hand-specimen for familiarization	CV1304.1	Quiz, MTE-II and ETE
13	Classification of rocks based on mode of formation and rock-cycle.				
14	Identification and description of Igneous rocks.				
15	Description of Granite, Rhyolite and Syenite.				
16	Description of Diorite, Basalt and Gabbro.				
17	Description of Dunite, Pegmatite and Dolerite.				
18	Description of Porphyries and Pumice.				
19	Formation and classification of Sedimentary rocks, primary structures and their description.				
20	Formation and description of Sandstones, Conglomerate, Breccia, Shale, Limestones and Laterite.				
21	Formation and classification of Metamorphic rocks.				
22	Description of Gneiss, Quartzite, Marble and Slate.				
23	Description of Phyllite and Schists.				
24	Rock as building material. Rocks as a building material.				

25	Introduction to Structural Geology, outcrop, dip and strike of a rock-bed, clinometer and compass.	Understanding the basics of the rock-alignment/attitude in the field	Lecture, introducing the instrument	CV1304.1	Quiz, MTE-II and ETE
26	Definition of primary and secondary structures: Folds; formation, classification and their significance in civil engineering.	Understanding the basics of geological structures important for Civil Engineers	Lecture		
27	Joints; formation, classification and their significance in civil engineering.				
	Faults formation, classification and their significance in civil engineering.				
28	Unconformity; formation, classification and their recognition and importance in Civil Engineering field investigation.				
29	Introduction to Geodynamics, Plate Tectonics, earthquake, seismic waves, magnitude and intensity scales.	Knowing the internal and external dynamism of the earth	Lecture with videos of real instances	CV1304.1 and CV1304.2	
30	Earthquake-recording instruments, characteristics of strong ground motions and attenuation.				
31	Earthquake occurrence in the world, seismic zoning map of India and its use.				
32	Tsunami and landslides, causes, effects and remedial measures.				
33	Physical Geology: Weathering (deterioration) of rocks, types of weathering and their agencies.	Knowing the external dynamism of the earth	Lecture with videos of real instances	CV1304.1 and CV1304.2	Quiz and ETE
34	Causes and products of weathering.				
35	Origin and development of river systems, erosion, transportation and deposition by rivers.				
36	Geological action of wind and its geomorphic features.				

37	Introduction to Hydrogeology, Hydrological cycle and distribution of ground water in the earth crust.	Understanding the basics of water-bearing rock formations, technique to recharge and exploration of groundwater	Lecture with videos of real instances	CV1304.1, CV1304.2 and CV1304.3	Quiz and ETE
38	Types and properties of water bearing geological formation.				
39	Selection of sites for well locations.				
40	Techniques of ground water exploration				
41	Artificial recharge of groundwater methods, rain water harvesting.				
42	Rain water harvesting.				
43	Sea water intrusion and remedial measures.	Knowing the importance of coastal dynamism with respect to the groundwater	Lecture		
44	Application of Engineering Geology in civil engineering projects, Geological considerations in selection of sites for Dams.	Understanding the application of geological knowledge in civil construction	Lecture with interactive sessions with students	CV1304.4	
45	Geological considerations in selection of sites for reservoirs.				
46	Geological considerations in selection of sites for tunnels.				
47	Geological considerations in selection of sites for bridges.				
48	Geological considerations in selection of sites for highways.				
49, 50	Revision; emphasizing the significance of geological structures in civil engineering construction				

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1304.1	Apply the fundamental knowledge of rocks, minerals, and geological structures while analysing / identifying and addressing the complex engineering problems when planning for sustainable building construction.	3	3	1	1	1	1	3	1	1	1	1	3	3	1	3	1
CV1304.2	Discern different geological processes, causing a variety of rock structures that may be disastrous to public health and safety and help in developing suitable solutions to civil constructions.	3	3	1	1	1	2	2	1	1	1	1	3	3	1	1	3
CV1304.3	Apprehend the importance and application of geophysical instruments / techniques in engineering geology to design as well as construct a safe, strong, durable and economically sustainable engineering structures.	3	1	3	3	3	1	1	3	3	1	1	3	3	1	3	1
CV1304.4	Explore the impact of various geological structures on civil constructions. Students can demonstrate the knowledge by participating in class debates and	3	3	1	1	1	3	1	1	2	3	1	3	1	3	2	3

	presentations on various topics of environmental concern with effective communication.																

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Surveying Practice | CV1330| 1 Credits | 0 0 3 1

Session: Jul 18-Nov 18 | Faculty: Alok Damare| Class: B.Tech Civil III SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental Core Course, it includes application of engineering mathematics and fundamental of physics. This course the build the capacity of the student in taking measurement on field, plot map/plan, set out work (i.e. building, tunnel, foundation etc.). Also offer them to work on advance instrument and software and deals with plane surveying and geodetic survey covering essential part of field.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1330.1]. Take measurement on the field.

[CV1330.2]. Analyse the problem and solution for all possible challenge on the field Plan a survey appropriately with the skill to understand the surroundings

[CV1330.3]. Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.

[CV1330.4]. Make entry in field book.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative) Internal Assessment (Viva, Lab performance, Lab book maintenance, Punctuality in lab) 60	Internal Assessment (Summative) Internal Assessment (Viva, Lab performance, Lab book maintenance, Punctuality in lab)	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Lab Experiments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup laboratory experiment will be performed on the topic taught on the day of absence and it will have to be performed within two weeks from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 3 throughout the entire semester.	

E. SYLLABUS

Chain survey- To conduct direct and indirect ranging, Construction of Geometric figures using chain and tape - triangle, pentagon, trapezium, and hexagon. To erect perpendicular from a given point using, Chain tape and Cross staff. Compass Survey-Study of compass and construction of regular pentagon and hexagon, Construction of a quadrilateral, Distance b/w two inaccessible points. Plane table surveying -Radiation and intersection methods, Solving three point problem by Bessel's solution, Plane table traversing. Levelling Study of instrument, Simple levelling, Height of instrument method, Rise and fall method including inverted staff reading, To find difference in level b/w two points by reciprocal levelling. Theodolite -Study of the instrument, Method of repetition, Method of reiteration, Measurement of vertical angles, to find RL when base of object is inaccessible, single plane method, double plane method, Distance b/w inaccessible points, Theodolite Traversing.

F. TEXT BOOKS

1. Punmia B.C., Surveying and Leveling Vol. I and II, Lakshmi Publishers, New Delhi 2005.

REFERENCE BOOKS

1. Subramanian R., Surveying and Levelling, Oxford University Press 2012.
2. Subramanian R., "Surveying and Levelling", Oxford University Press 2012.
3. Chandra A.M., Plane Surveying, New Age International Pvt. Ltd., 2011

4. Punmia B.C., Surveying Vol. I and II, Lakshmi Publications, New Delhi, 2005

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction to surveying practice Lab-I	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	lecture		NA
2	To measure the distance between two points on a level ground by ranging	Make entry in field book.	Practice lab	**CV1330.4**	Field visit viva
3	To measure the area of the given field by chain	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings	Practice lab	**CV1330.2**	Field visit viva
4	Chaining a line when a hill or high ground intervenes preventing intervisibility of ends of line	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Practice lab	**CV1330.4**	Field visit viva
5	To determine the magnetic bearing of line and adjustment of included angles using a compass	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings	Practice lab	**CV1330.2**	Field visit viva
6	To prepare the map of given area by plane table survey	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Practice lab	**CV1330.4**	Field visit viva
7	Two point problem using plane table	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings	Practice lab	**CV1330.2**	Field visit viva
8	To determine the reduce level and carry out profile levelling and plot longitudinal and	Make entry in field book.	Practice lab	**CV1330.4**	Field visit viva

9	to determine the RL of a point wrt MSL	Make entry in field book.	Practice lab	**CV1330.4**	Field visit viva
10	10 to determine the floor height by Autolevel.	Make entry in field book.	Practice lab	**CV1330.4**	Field visit viva
11	To find difference in level b/w two points by reciprocal levelling	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings	Practice lab	**CV1330.2**	
12	To prepare a contour map of given area	Make entry in field book.	Practice lab	**CV1330.4**	
13	to determine the hight of tower by using theodolite.	Make entry in field book.	Practice lab	**CV1330.4**	Field visit viva
14	to determine Distance and elevation by total station	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings	Practice lab	**CV1330.4**	
15	To set out a simple curve.	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.	Practice lab	**CV1330.4**	

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CV1330.1]	Take measurement on the field.	2			2	3	1		2	3	1				3	2	1
[CV1330.2]	Analyse the problem and solution for all possible challenge on the fieldPlan a survey appropriately with the skill to understand the surroundings		3	1	3										3		
[CV1330.3]	Learn and understand working of basic and advance instrument to perform different exercises on the field. Which create employability and entrepreneurship.					3							2		3		2
[CV1330.4]	Make entry in field book.	3							3			2		3			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Material Testing Lab-I | CV1331| 1 Credits | 0 0 2 1

Session: Aug 18 – Nov 18 | Faculty: Sourav Kumar Das | Class: B.Tech Civil III SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental Lab Course, targeting students to perform different basic test on the properties of material. It introduces the students to basic theory and concepts of strength of material. Students will learn how to perform the test and what are the resemblance of a particular test to the practical use of it in the field.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1331.1]. Understanding the concept of the different properties of materials
[CV1331.2]. Applying the concept to determine their properties
[CV1331.3]. Enhance entrepreneurship skill
[CV1331.4]. Analysing and applying the properties will lead to employability
[CV1331.5]. Skills to work in groups or independently

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Assessment (Viva, Lab performance, Lab book maintenance, Punctuality in lab)	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Lab Experiments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup laboratory experiment will be performed on the topic taught on the day of absence and it will have to be performed within two weeks from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 3 throughout the entire semester.	

E. SYLLABUS

Tension test on mild steel, Compression test on cast iron, Compression test on timber, Shear test on mild steel specimen, Torsion test on mild steel specimen, Rockwell hardness test, Brinell's Hardness test, Impact tests: a)Izod b)Charpy, Bending test on wood, Fatigue test (Demonstration), Test on Bricks - Compressive Strength, Absorption, Efflorescence, Tests on Flooring and Roofing Tiles: Wear resistance (Dorry's abrasion Test), Knife Edge Load Absorption, Tests on Bitumen: Specific Gravity, Viscosity, Softening Point, Flash and Fire Point, Ductility, Penetration Value.

F. REFERENCE BOOKS

I. Suryanarayana A.V.K., Testing of Metallic Materials, Prentice Hall of India, New Delhi, 1990.

II. Khanna & Justo, Highway Materials Testing, Nemchand, New Chand, 1989.

III. Technical Teachers, Training Institute, Laboratory Manual of Strength of Materials, Oxford University Press, 1983.

G. Lecture Plan:

Lecture Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction	Introduction to Material Testing Lab-I	Lab Practical	CV1331.1	NA
2	Determination of bending stress and young's modulus	To determine the Bending stress and Young's Modulus of elasticity of a material of beam simply supported at ends and carrying a concentrated load at the centre.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
3	Hardness test	To determine Brinell & Rockwell Hardness Number of a metallic specimen.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
4	Toughness test	To determine the toughness of a Mild Steel specimen by Charpy & Izod Impact test	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
5	Test on wood	To find the Compressive Strength and Material Properties of a wood specimen by conducting Compression Test on CTM.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
6	Shear strength test	To determine the shear strength of a mild steel specimen by Single and Double Shear Test on UTM.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
7	Tensile strength test	(i) To study the behaviour of mild steel specimen under the action of gradually increasing load tested up to failure. (ii) To determine yield stress, ultimate tensile strength, modulus of elasticity and Poisson's ratio.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
8	Torsion test	To determine the modulus of rigidity of a solid circular rod by conducting Torsion Test.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
9	Test on ceramic tiles	To determine the breaking load of Ceramic flooring tiles.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
10	Test on roof tiles	To determine the percentage of water absorption of roofing tiles.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
11	Test on Bitumen	To measure the ductility of a given sample of bitumen	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
12		To determine the flash and fire point of bitumen	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
13		To determine the softening point of bitumen/ tar.	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment
14	Test on clay brick	To determine the percentage of water absorption of bricks and its Compressive strength	Lab Practical	CV1331.2, CV1331.3, CV1331.4, CV1331.5	Daily Lab Assessment

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	
CV CV133 1.1	Understanding the concept of the different properties of materials	3	2										3	1	1			
CV CV133 1.2	Applying the concept to determine their properties	3	2				1						3	3	3	2	1	
CV CV133 1.3	Enhance entrepreneurship skill		2	2		3	3						3		1		3	
CV CV133 1.4	Analysing and applying the properties will lead to employability		3	3		3	2						3	2	3		3	
CV CV133 1.5	Skills to work in groups or independently									3			3			3	3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Signatures

Course Instructor(s) **Head of Department**

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering

Course Hand-out

Value, Ethics & Governance BB1101 [2 Credits] [2 0 0 2]

Session: Aug - Nov, 2018| Faculty: Monika Mathur | Class: III SEM

Introduction: The course is offered to understand Moral Values and Ethics in personal as well as professional life. It is basic requirement of every human to be a good human being and a good citizen. It further imparts him basics of corporate governance so as to empower him to work technically and professionally in any organization with confidence and conviction and at the same time with honesty & integrity.

A. **Course Objectives:** At the end of the course, students will be able to

BB1101.1	Define the meaning and relevance of Value and Ethics and apply in personal & professional life.
BB1101.2	Describe the importance of three Gunas for self-development, lifelong learning & growth.
BB1101.3	Find issues and identify solutions related to Public & Private Governance systems.
BB1101.4	Explain the relevance of Company's Act 2013 with reference to corporate world.
BB1101.5	Explain the role and key objectives of organizational governance in relation to ethics and law.
BB1101.6	Demonstrate the social & environmental responsibilities of corporate for sustainability, harmony and growth.

B. **Program Outcomes and Program Specific Outcomes**

PROGRAM OUTCOMES

[PO.1]. **Engineering knowledge**: Demonstrate and apply knowledge of Mathematics, Science and Engineering to classical and recent problems of electronic design & communication system.

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design a component system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environment.

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. An ability to understand the concepts of basic Electronics & Communication Engineering and to apply them to various areas like signal processing, VLSI, Embedded systems, Communication Systems, Digital & Analog Devices, etc.

[PSO.2]. An ability to solve complex Electronics Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

[PSO.3]. Wisdom of social and environmental awareness along with ethical responsibility to have a successful career and to sustain passion and zeal for real applications using optimal resources as an Entrepreneur.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Sem Exam I (Close Book)	15
	Mid Sem Exam II (Close Book)	15
	In class Quizzes/ Assignments Students' Presentations	20(Min 5 each) 10
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

D: **Syllabus:**

Values: Relevance of Value Education in day-to-day life. Mantra for success - Value, Moral and Ethics. Determinants of human nature (Three Gunas) and its impact on human life.

Relevance of traits like Personality, Attitude, Behaviour, Ego, Character, introspection, Motivation, Leadership and 4 Qs with relevant Case Studies*.

Governance: Understanding of Public and Private sector Governance systems; Courts & CAG.

Public Sector Governance: Need, relevance, stakeholders.

Private Sector Governance: Proprietary, Partnership, Company (Pvt Ltd & Ltd), Company' Act 2013, Board of Directors; its Roles and Responsivities. Regulatory bodies; its role in ethical governance.

Projects on PPP mode-relevance & prospects.

CSR: Relationship with Society, Philanthropy and Business strategy, CSR Policy, Triple Bottom Line

Text / Reference Books:

1. Professional Module of ICSI.
2. Ghosh B.N., Business Ethics & Corporate Governance, McGraw Hill.
3. Mandal S.K., Ethics in Business & Corporate Governance, McGraw Hill .
4. Ray C.K., Corporate Governance, Value & Ethics, Vaya Education of India
5. Chatterjee Abha, Professional Ethics, Oxford Publications.

***Suggestive Case Studies:**

1) Uphar Theatre Tragedy- Engineering Ethics
2) Bhopal Gas Tragedy- Operational Engineering Ethics
3) Satyam Case- Financial Reporting Ethics
4) Enron Case- Business Ethics
5) Neerav Modi Case- Financial Fraudulence *cases*

D. **Lecture Plan:**

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	**Introduction: Values:** Meaning & Relevance of value education	To acquaint and clear teacher's expectations and understand student expectations. Basics of Value Education	Lecture	BB 1101.1	In class Quiz Mid Term I End Term Exam
2	Success: Meaning in perspective of morals & ethics	To understand the concept of success achieved with or without morals / ethics/ values	Lecture, case study	BB 1101.1	In class Quiz Mid Term I End Term Exam

3,4	Professional Ethics & ethical dilemmas Case study-Neerav Modi	To understand the role of professional ethics in the life & deal with dilemmas	Lecture	BB 1101.1	In class Quiz, assignment Mid Term I End Term Exam
5	Three Gunas and their relevance, Nature and kinds of value with examples	Understand basic traits in one's personality, its causes and relevance with value based living.	Lecture	BB 1101.2	In Class Quiz, Mid Term I End Term
6,7	Relevance of traits of individual like Personality, Attitude, Behaviour	To acquaint & develop positive traits of personality in oneself	Short stories, Lecture	BB 1101.2	Class Quiz assignment Mid Term I End Term
8.9	Ego, Character, introspection, Motivation	To acquaint & develop positive traits of personality in oneself and understand negative traits	Lecture Short stories	BB 1101.2	In Class Quiz Mid Term I End Term
10,11	Leadership traits & 4Qs (PQ, IQ, EQ, SQ)	To realize importance of leadership and to imbibe in life	Lecture Short stories	BB 1101.2	In Class Quiz assignment Mid Term I End Term
12,13	Governance & its relevance Case studies- Bhopal Gas & Uphar Cinema	To acquaint with the concept of Governance	Lecture	BB 1101.3	In Class Quiz Mid Term II End Term
14	Public Sector Governance: Need, relevance, stakeholders	Understand various aspects of public sector governance	Lecture	BB 1101.3	Class Quiz, Mid Term II End Term
15	Public Finance, Audit & Control	Understand basics of Public Finance, Check & balance	Lecture Case study	BB 1101.3	Class Quiz, assignment Mid Term II End Term
16,17	Private Sector Governance, proprietary & partnership firms and corporate, PPP mode projects	Understand meaning of proprietary & partnership in a firm / company and perspective in PPP mode	Lecture Short stories	BB 1101.3 & 1101.4	Class Quiz Mid Term II End term
18, 19	Company' Act 2013 : Roles & Responsibilities of Directors & regulatory authorities	Explain various Regulations and practices of Corporate Governance internationally & understand key role of directors	Lecture	BB 1101.4	Class Quiz Mid Term II End Term
20,21	Role of Ethics in Governance Case studies- Satyam & Enron	Recognize the necessity of ethics & transparency in Governance	Movie : Gandhi	BB 1101.5	Class Quiz, assignment Mid Term II End Term
22,23	CSR: Relationship with Society, Philanthropy and Business strategy	To understand the relevance of giving back to society by a corporate & its importance in society	Lecture, case study	BB 1101.6	Class Quiz, End Term
24	CSR Policy, Triple Bottom Line	Understand the concept of TBL in organizational frameworks	Lecture case study	BB 1101.6	Class Quiz assignment End Term
25,26	Students' Presentation	Recall contents and their importance through case studies.	Flipped Class	ALL	Class Quiz End Term

Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BB1101.1	Define the meaning and relevance of Value and Ethics and apply in personal & professional life.						1		2							
BB1101.2	Describe the importance of three Gunas for self-development, lifelong learning & growth.						1		2	1	1		2			1
BB1101.3	Find issues and identify solutions related to Public & Private Governance systems.						1	1		1	2					
BB1101.4	Explain the relevance of Company's Act 2013 with reference to corporate world.						1		1	1						
BB1101.5	Explain the role and key objectives of organizational governance in relation to ethics and law.						1		2	1			1			1
BB1101.6	Demonstrate the social & environmental responsibilities of corporate for sustainability, harmony and growth.						1	3				1	1			3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Important Dates for Jan-May 2019 session

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering
Department of Civil Engineering
Course Hand-out
Fluid Mechanics-II |CV1401| 3 Credits | 3 0 0 3
Session: Jan, 2019 – June 2019| Faculty: Dr. Parwez M. Akhtar | Class: 3rd Semester B.Tech(Civil)

A. INTRODUCTION: This course is offered by Dept. of Civil Engineering as an 4th semester course, targeting students who want to pursue a career particularly in the broad domain of hydraulics, water and water resources related technology and management and to extent for those who intends to pursue higher studies in the field of fluid dynamics related sciences and engineering, such as river mechanics and morpho-dynamics, computational hydraulics, environment and eco-hydraulics, water supply and waste water distribution network, water quality management, Ocean and sea shore engineering, Navigation and related engineering, Climate modelling, etc. This is a beginners as well as preliminary course as such only fundamentals of fluid properties and behaviour aspects with a goal of developing a systematic report on the Applied Engineering Fluid Mechanics is taught. Understanding of applied and exposure to advance fluid mechanics, free surface flows, boundary layer theory, prominent hydraulic machinery namely turbines and pump are in general basic components of the course. This course is fundamentally multi-disciplinary engineering course, as such participating students are expected to have a strong background knowledge of basics sciences such as physics and applied mathematics as well as preliminary theoretical fluid mechanics.

B. COURSE OUTCOMES: At the end of the course, students will be able to:

[CV1401.1]. Understand and comprehend the basic concept and importance of open channel flow including preliminary design and analysis of systems apparatus involving application and evaluation and enhance employability.

[CV1401.2]. Understand and comprehend various practical flow condition encountered in real world such as hydraulic jump/ varied flow of fluid motion through knowledge of mathematics/science/fundamentals and solution of complex engineering problems. Critical review and analysis

[CV1401.3]. To Understand/comprehend and be able to solve Boundary layer Theory and application

[CV1401.4]. Over view and understand hydraulic machinery processes for turbines and pumps their design, application and be able to evaluate their performances.

[CV1401.5]. be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks to promote entrepreneurship.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. PROBLEM ANALYSIS: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including preliminary prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes(15) + Assignments(05)+/group projects(10)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked **blank**, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom	

	participation by a student will be assessed and marks will be awarded.

D. SYLLABUS

Flow in open Channels: Chezy's and Manning's formulas, hydraulically efficient channel cross section, specific energy curve, Froude's Number and its significance; Gradually varied flow: Dynamic equation of GVF, characteristics and classification of flow profiles. Step method of computation of back water curve (M1) type only; rapidly varied flow: Hydraulic jump in rectangular channel, loss of energy in hydraulic jump, Venturi standing wave and Parshall flumes. Boundary layer theory: Concept of boundary layer; Boundary layer thickness; Laminar and turbulent boundary layer on flat plate; Separation of boundary layer and measures to control. Hydraulic turbines: Description and general working principles of Pelton, Francis and Kaplan turbines, Work done and efficiencies of impulse and reaction turbine; Governing of turbines, Selection of turbines. Centrifugal Pump: Description and general working principle of centrifugal pumps, work done and efficiencies, multistage pumps; pumps in series and pumps in parallel.

E. TEXT BOOKS

1. Modi P.N. and Seth S.M, Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2013.
2. Chow V.T., Open channel Hydraulics, Tata McGraw - Hill Publishing Co., Ltd., New Delhi, 1985.
3. Garde R.J. and Mirajgaokar A.G., Engineering Fluid Mechanics (including Hydraulic Machines), Nem Chand & Bros, Roorkee, Second Edn, 1983.
4. Raju K.G.R., Flow through Open Channels, Second Ed. Tata McGraw- Hill Publishing Company Limited, New Delhi, 1993.

F. REFERENCE BOOKS

1. Çengel Yunus A. and Cimbala John M., Fluid Mechanics Fundamentals and Applications Tata McGraw Hill Education Pvt. Limited New Delhi, 2011
2. Pritchard Philip J. and Leylegian John C., Fluid Mechanics, Wiley India Ltd. New Delhi, 2012

G. LECTURE PLAN:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1, 2	Flow in open Channel	Concept of Chezy's and Manning's formulas	Lecture/In Class Quiz	CV1401.1, CV1401.5	1st Sessional ET Exam Home Assignment In class quiz,
3,4	Flow in open Channel	Hydraulically efficient channel cross section	Lecture/ In Class Quiz	CV1401.1	1st Sessional ET Exam Home Assignment In class quiz,

5,6	Flow in open Channel	Specific energy curve.	Lecture/ In Class Quiz	CV1401.1	1st Sessional ET Exam Home Assignment In class quiz,
7,8	Flow in open Channel	Froude's Number and its significance	Lecture/ In Class Quiz	CV1401.1	1st Sessional ET Exam Home Assignment In class quiz,
9,10	Gradually Varied Flow	Dynamic equation of GVF	Lecture/ In Class Quiz	CV1401.2	
11,12	Gradually Varied Flow	Characteristics and classification of flow profiles.	Lecture/ In Class Quiz	CV1401.2, CV1401.5	
1st Sessional Examination					
13, 14	Gradually Varied Flow	Step method of computation of back water curve (M1) type only.	Lecture/ In Class Quiz	CV1401.2	2nd Sessional ET Exam Home Assignment In class quiz/group project
15,16	Rapidly Varied Flow	Hydraulic jump in rectangular channel	Lecture/ In Class Quiz	CV1401.2	
17	Rapidly Varied Flow	Loss of energy in hydraulic jump	Lecture/ In Class Quiz	CV1401.2	
18	Rapidly Varied Flow	Venturi standing wave and Parshall flumes	Lecture/ In Class Quiz	CV1401.2	2nd Sessional ET Exam Home Assignment In class quiz /group project
19, 20	Boundary Layer Theory	Concept of boundary layer	Lecture/ In Class Quiz	CV1401.3, CV1401.5	
21	Boundary Layer Theory	Boundary layer thickness	Lecture/ In Class Quiz	CV1401.3	
22	Boundary Layer Theory	Laminar and turbulent boundary layer on flat plate	Lecture/ In Class Quiz	CV1401.3	2nd Sessional ET Exam Home Assignment In class quiz/group project
23	Boundary Layer Theory	Separation of boundary layer and measures to control	Lecture/ In Class Quiz	CV1401.3	
24	Hydraulic Turbines	Description and general working principles of Pelton	Lecture/ In Class Quiz	CV1401.4, CV1401.5	
2nd Sessional Examination					
25, 26	Hydraulic Turbines	Francis and Kaplan turbines	Lecture/ In Class Quiz	CV1401.4	ET Exam Home Assignment/group project
27, 28	Hydraulic Turbines	Work done and efficiencies of impulse	Lecture/ In Class	CV1401.4	ET Exam Home In class

		and reaction turbine	Quiz		quiz/group project
29	Hydraulic Turbines	Governing of turbines	Lecture/ In Class Quiz	CV1401.4	
30	Hydraulic Turbines	Selection of turbines	Lecture/ In Class Quiz	CV1401.4	ET Exam Home In class quiz/group project
31, 32	Centrifugal Pump	Description and general working principle of centrifugal pumps	Lecture/ In Class Quiz	CV1401.4, CV1401.5	ET Exam Home In class quiz/group project
33, 34	Centrifugal Pump	Work done and efficiencies	Lecture/ In Class Quiz	CV1401.4	ET Exam Home In class quiz/group project
35	Centrifugal Pump	Multistage pumps	Lecture/ In Class Quiz	CV1401.4	ET Exam Home In class quiz
36	Centrifugal Pump	Pumps in series and pumps in parallel	Lecture/ In Class Quiz	CV1401.4, CV1401.5	ET Exam Home Assignment In class quiz/group project
END TERM EXAM					

H. COURSE ARTICULATION MATRIX: (MAPPING OF COS WITH POS)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	PSO 1	PSO 2	PSO 3	PSO 4
CV 1401.1	Understand and comprehend the basic concept and importance of open channel flow including preliminary design and analysis of systems apparatus involving application and evaluation and enhance employability.	3	3	3	2	2		1	1		1	1	3	1	1	1	
CV 1401.2	Understand and comprehend various practical flow condition encountered in real world such as hydraulic jump/ varied flow of fluid motion through knowledge of mathematics/science/fundamentals and solution of complex engineering problems. Critical review and analysis	3	3	3	2	2		1	1		1	1	3	2	2	1	
CV1401.3	To Understand/comprehend and be able to solve Boundary layer Theory and application	3	3	2	3	2		1			1		3	1	1	1	
CV1401.4	Over view and understand hydraulic machinery processes for turbines and pumps their design, application and be able to evaluate their performances.	3	3	3	2	2		2	1		1	2	3	1	1	1	1
CV1401.5	Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks to promote entrepreneurship.	3	3	3	2	2		2	1		1	2	3	1	1	1	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Structural Analysis-I | CV1402| 4 Credits | 3 1 0 4

Session: Jan 19 - May 19 | Faculty: Kamal Kumar | Class: B.Tech Civil IV SEM

A. **Introduction:** This course is offered by Dept. of Civil Engineering as a Departmental Core Course, targeting students who wish to pursue higher studies in the field of Structural Engineering. It introduces the students to basic theory and concepts of structural analysis and the classical methods for the analysis of determinate structures. Students will learn how to analyse determinate structures by hand to determine reactions, internal resistance (axial load, moment, and shear) and deformations that result from external loadings.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CV1402.1]. Define basic structural engineering terminology

[CV1402.2]. Derive and draw the shear and bending moment equations and diagrams respectively

[CV1402.3]. Distinguish between stable and unstable and statically determinate and indeterminate structures

[CV1402.4]. Determine slope, deflections, torsion, stresses of beams by using different methods

[CV1402.5]. Familiarise with contemporary issues and solving them in structural engineering domain to enhance employment and entrepreneurship.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

Introduction: Overview and scope of the subject, **Stress and Strain:** Thick Cylinders and Shells, Stresses due to Impact and Suddenly Applied Load – Compound Bars. **Mohr Circle Method:** Mohr's circle of stress and strain. Failure theories. **Analysis of Plane Truss:** Method of joints and section, **Shear Force and Bending Moments:** Shear force and bending moment diagrams for statically determinate beams, Relationships between SF & BM and loads intensity, **Bending and Shearing Stresses:** Bending and shearing stresses in statically determinate beams, **Deflection:** Determination slope and deflection in statically determinate beams using Macaulay's method, moment-area method and conjugate beam method. **Stability of Columns:** Slenderness ratio, failure by buckling, Euler formula, concept of equivalent length for different support conditions, limitation of Euler's formula, Rankine-Gordon formula, **Torsion:** Torsion of circular shaft - simple torsion theory, solid and hollow circular shaft, **Arches and Suspension Bridge:** Analysis of three hinged parabolic and segmental arches, determination of horizontal reaction, normal thrust, radial shear and bending moment, analysis of suspension bridge with the hinged stiffening girder.

E. TEXTBOOKS

I. Rajput R.K., Strength of Materials, S Chand & Co., 2015.
II. Bhavikatti, S.S., Structural Analysis – I & II, Vikas Publishing House Pvt. Ltd., 2013.
III. Ramamrutham. S & Narayanan. R, Strength of Materials, Dhanpat rai Publishing Co., 2017.

F. REFERENCE BOOKS

I. Hearn E.J., Mechanics of Materials, Vol. I, Pergamon Press, 2008.
II. Gahlot, P.S. and Gehlot, D., Fundamentals of Structural Mechanics, CBS Publishers & Distributors Pvt. Ltd., 2012.
III. Subramanian, R., Strength of Materials, Oxford University Press, 2012.

G. Lecture Plan:

Lecture Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-2	Introduction	Introduction: Overview and scope of the subject (properties of metals), Basic concepts	Lecture	CV1402.1	NA
3-5	Stress & Strain	Stress & Strain	Lecture	CV1402.1	Class Quiz / Test
6-8	Mohr Circle Method	Mohr's circle of stress and strain	Lecture	CV1402.4	Class Quiz / Test
9-11	Stresses due to Impact and Suddenly applied load	Stresses due to Impact and Suddenly Applied Load – Compound Bars	Lecture	CV1402.4	Class Quiz / Test
12-15	Plane truss analysis	Analysis of Plane Truss: Method of joints and section	Lecture	CV1402.3	Class Quiz / Test
16-20	Shear Force and Bending Moment calculation	Shear force and bending moment diagrams for statically determinate beams	Lecture	CV1402.2	Class Quiz / Test
21		Relationships between SF & BM and loads intensity	Lecture	CV1402.2	Class Quiz / Test
22-23		Bending and shearing stresses in statically determinate beams	Lecture	CV1402.2	Class Quiz / Test
24-25	Deflection calculation	Deflection: Determination slope and deflection in statically determinate beams using Macaulay's method	Lecture	CV1402.4	Class Quiz / Test
26-27		Deflection: Determination slope and deflection in statically determinate beams using Moment Area Method	Lecture	CV1402.4	Class Quiz / Test
28-30		Deflection: Determination slope and deflection in statically determinate beams using Conjugate Beam Method	Lecture	CV1402.4	Class Quiz / Test
31	Stability of column analysis	Stability of Columns: Slenderness ratio, failure by buckling	Lecture	CV1402.4	Class Quiz / Test
32-33		Euler formula, concept of equivalent length for different support conditions, limitation of Euler's formula	Lecture	CV1402.4	Class Quiz / Test
34		Rankine-Gordon formula	Lecture	CV1402.4	Class Quiz / Test
36-38	Torsion analysis	Torsion of circular shaft - simple torsion theory, solid and hollow circular shaft	Lecture	CV1402.4	Class Quiz / Test
39-40	Thick Cylinders and Shells	Thick Cylinders and Shells	Lecture	CV1402.4	Class Quiz / Test
41-42	Failure Theories	Failure Theories	Lecture	CV1402.3	Class Quiz / Test
43-45	Three hinge arch and suspension bridge analysis	Analysis of Arches and Suspension Bridge- analysis of three hinged parabolic and segmental arches, determination of horizontal reaction, normal thrust, radial shear and bending moment	Lecture	CV1402.3	Class Quiz / Test
46-48		Analysis of suspension bridge with the hinged stiffening girder.	Lecture	CV1402.3	Class Quiz / Test

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CV1402.1]	Define basic structural engineering terminology**.**		1								1		2	1			3
[CV1402.2]	Derive and draw the shear and bending moment equations and diagrams respectively.	3	3	3		3				1			2	2	2		
[CV1402.3]	Distinguish between stable and unstable and statically determinate and indeterminate structures.	3		3	2								2	2	2		
[CV1402.4]	Determine slope, deflections, torsion, stresses of beams by using different methods.	3	3	3		3				1			2	2	2		
[CV1402.5]	Familiarise with contemporary issues and solving them in structural engineering domain to enhance employment and entrepreneurship.	2		2	3		3		1	2		1	2	3	2	3	

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Structural Design I| CV1403 | 4 Credits | 4 0 0 4

Session: Jan 19-May 19 | Faculty: Shaik Hussain| Class: B.Tech Civil IV SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course and purpose of the course is for students to get familiar with basics of Concrete structures, both reinforced and unreinforced. Study of this course work includes details of concrete properties, various structural members made of reinforced concrete, design philosophies, behavior of these members in flexure and compression. All of this that are crucial for a student to have a promising career as a civil engineer. The student, by the end of the semester would be able to successfully design a flexure member for bending and shear, a column and footing for compression. The civil engineering market demands a student to be aware of these details to ensure they are employable. Also, the student would be erudite enough to estimate the strength of concrete by various mechanical strength tests and durability tests.

B. Course Outcomes: At the end of the course, students will be able to:

[1403.1]. Learn concepts of fundamentals of reinforced concrete design.
[1403.2]. Identify different types of structural elements based on applied force or moment.
[1403.3]. Design of structural elements in flexure and compression.
[1403.4]. Prepare detailed design and drawings to be execute in the field
[1403.5]. Evaluate the behaviour of structural interaction.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

E. SYLLABUS

Introduction: Overview and scope of the subject, Concrete Mix Design as per IS code procedure. Straight line Theory: Determination of neutral axis, stress and strain, and moment of resistance of singly reinforced and doubly reinforced sections. Determination of short term, long term deflections of R.C beams & Crack width; Limit state method: Principles. Design of singly reinforced, doubly reinforced, and flanged beams. Design of one way and two way slabs: for various boundary conditions. Design of columns: combined axial load and biaxial bending of short columns. Use of SP16 handbook. Staircases: types of stairs, design of dog-legged and open newel types, spiral.

F. TEXT BOOKS

1. Verghese P.C., Limit State Design of Reinforced Concrete, Prentice Hall of India, New Delhi, 2009

REFERENCE BOOKS

1. Shah H.J., Reinforced Concrete, Vol. I, Charotar Publishing house, Anand, 2011
2. Raju N.K., Reinforced Concrete Design: Principles and Practices, New Age International, 2010
3. Syal I.C. and Goel A.K., Reinforced Concrete Structures S. Chand and Co. 2012
4. Gambhir M.L., Fundamentals of Reinforced Concrete Design, PHI Learning, 2012

G. Tutorial Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Concrete 1	Learn concepts of fundamentals of reinforced concrete design.	lecture	**[CV1403.1]**	NA

2	Concrete 2	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	In Class Quiz
3	Concrete 3	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	In Class Quiz End Term
4	Concrete 4	Prepare detailed design and drawings to be execute in the field	tutorial	**[CV1403.4]**	
5	Concrete 5	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	
6	Concrete 6	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	1st Sessional ET Exam Home Assignment
7	Concrete 7	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	
8	Concrete 8	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	
9	WSM 1	Prepare detailed design and drawings to be execute in the field	lecture	**[CV1403.4]**	1st Sessional ET Exam Home Assignment
10	WSM 2	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	
11	LSM 1	Learn concepts of fundamentals of reinforced concrete design.	lecture	**[CV1403.1]**	
12	LSM 2	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	1st Sessional ET Exam Home Assignment
13	LSM 3	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	
14	LSM 4	Prepare detailed design and drawings to be execute in the field	tutorial	**[CV1403.4]**	
15	SINGLY BEAM DESIGN 1	Evaluate the behaviour of structural interaction.	lecture	**[CV1403.4]**	1st Sessional ET Exam Home Assignment
16	SINGLY BEAM DESIGN 1	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	
17	SINGLY BEAM DESIGN 2	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	

18	SINGLY BEAM DESIGN 3	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	1st Sessional ET Exam Home Assignment
19	SINGLY BEAM DESIGN 4	Prepare detailed design and drawings to be execute in the field	tutorial	**[CV1403.4]**	
20	Doubly Beam design 1	Evaluate the behaviour of structural interaction.	lecture	**[CV1403.4]**	
21	Doubly Beam design 2	Learn concepts of fundamentals of reinforced concrete design.	lecture	**[CV1403.1]**	1st Sessional ET Exam Home Assignment
22	Doubly Beam design 3	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	
23	Numerical problem	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	
24	Numerical problem	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	2ndSessional ET Exam Home Assignment
25	Numerical problem	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	
26	Numerical problem	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	
27	Numerical problem	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	2nd Sessional ET Exam Home Assignment
28	Numerical problem	Prepare detailed design and drawings to be execute in the field	tutorial	**[CV1403.4]**	
29	Column design 1	Evaluate the behaviour of structural interaction.	lecture	**[CV1403.4]**	
30	Column design 2	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	

31	Column design 3	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	2ndSessional ET Exam Home Assignment
32	Column design 4	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	
33	one way slab 1	Prepare detailed design and drawings to be execute in the field	lecture	**[CV1403.4]**	2nd Sessional ET Exam Home Assignment
34	one way slab 2	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	
35	one way slab 3	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	
36	two way slab 1	Identify different types of structural elements based on applied force or moment.	lecture	**[CV1403.2]**	2ndSessional ET Exam Home Assignment
37	two way slab 2	Design of structural elements in flexure and compression.	tutorial	**[CV1403.3]**	
38	two way slab 3	Prepare detailed design and drawings to be execute in the field	tutorial	**[CV1403.4]**	

39	two way slab 4	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	
40	two way slab 5	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	
41	footing design 1	Identify different types of structural elements based on applied force or moment.	tutorial	**[CV1403.2]**	2nd Sessional ET Exam Home Assignment
42	footing design 3	Prepare detailed design and drawings to be execute in the field	lecture	**[CV1403.4]**	
43	footing design 4	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	
44	Staircase design 1	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	
45	Staircase design 2	Identify different types of structural elements based on applied force or moment.	lecture	**[CV1403.2]**	
46	Staircase design 3	Design of structural elements in flexure and compression.	lecture	**[CV1403.3]**	
47	Staircase design 4	Prepare detailed design and drawings to be execute in the field	tutorial	**[CV1403.4]**	
48	Staircase design 5	Evaluate the behaviour of structural interaction.	tutorial	**[CV1403.4]**	
49	Staircase design 6	Learn concepts of fundamentals of reinforced concrete design.	tutorial	**[CV1403.1]**	

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CV1404.1]	Learn concepts of fundamentals of reinforced concrete design.	3	2											1			
[CV1404.2]	Identify different types of structural elements based on applied force or moment.											3			3		
[CV1404.3]	Design of structural elements in flexure and compression.					3			3		2	3				3	
[CV1404.4]	Prepare detailed design and drawings to be execute in the field											2					2
[CV1404.5]	Evaluate the behaviour of structural interaction.											2					3

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Building Design And Drawing | CV1430| 1 Credits | 0 0 3 1

Session: January 19 – May 19 | Faculty: Sanchit Anand | Class: Departmental Laboratory Course

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental Laboratory Course, targeting students who wish to pursue higher studies in the field of Structural Engineering. The first part of the course is to introduce the students to understand the commands of AutoCAD and use them in a sequential procedure and steps while drawing plan, elevation and section. In the second part student will draw the same work practised on AutoCAD, on A1 drawing sheet using different geometrical tools.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1430.1]. **Replicate** any furnishing details in a residential building in reality into a drawing

[CV1430.2]. **Create** a detailed building plan with elevation and cross sectional elevation.

[CV1430.3]. **Use** computer software like AutoCAD to convey the building drawing.

[CV1430.4]. **Learn** the procedures of submission of drawings and Develop working and submission Drawings for building

[CV1430.5]. **Prepare, read** and **interpret** the drawings which will improve student skills leading to better employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Assessment (Viva, Lab performance, Lab book maintenance, Punctuality in lab)	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Lab Experiments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup laboratory experiment will be performed on the topic taught on the day of absence and it will have to be performed within two weeks from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 3 throughout the entire semester.	

E. SYLLABUS

Introduction: Overview and scope of the subject;
Introduction to AutoCAD: Drafting plan and elevation of single bed room RCC building with flat roof;
Foundations: Masonry foundations, RCC Footings - Isolated, Combined and Raft footings;
Doors and Windows: Wooden and Aluminium doors, PVC and Steel doors such as Collapsible Doors, Wooden windows, Aluminium windows;
Designing and Drawing of Residential Buildings: Plan, Elevation and Sectional views of Single bedroom house with Mangalore tiled roof, Double bedroom house with RCC roof;
Designing and Drawing of Public Buildings: Plan, Elevation and Sectional views of School, Bank, and Health Centre for the given Line Diagram.

F. TEXT BOOKS

I. Balagopal Pabhu T.S., Paul K.V. and Vijayan C., Building Design of Civil Engg. Drawing, Spades Publishers, Calicut. 1999.

G. REFERENCE BOOKS

II. Rangwala S.C., Elementary and Advanced Building Construction. 2009.

H. Lecture Plan:

Lecture Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction	Basic Interface of AutoCAD and commonly used commands	Lab Practical	CV1430.3	NA
2	Residential Building	Plan & Elevation of a Residential Building	Lab Practical	CV1430.3 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
3	Public Building	Plan & Elevation of a Public Building	Lab Practical	CV1430.3 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
4	Staircase	Staircase Plan and Elevation in AutoCAD	Lab Practical	CV1430.3 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
5	Door, Window and foundation	Plan and Elevation of Door, Window & Foundation	Lab Practical	CV1430.3 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
6	Residential Building	Section of Residential Building	Lab Practical	CV1430.3 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
7	Residential Building	Plan of a Residential Building	Lab Practical	CV1430.1 CV1430.2 CV1430.5	Daily Lab Assessment
8	Public Building	Plan of a Public Building	Lab Practical	CV1430.1 CV1430.2 CV1430.5	Daily Lab Assessment
9	Residential Building	Elevation & Section of Residential Building	Lab Practical	CV1430.1 CV1430.2 CV1430.5	Daily Lab Assessment
10	Health Center	Plan, Elevation and Sectional views and Health Centre for the given Line Diagram	Lab Practical	CV1430.1 CV1430.2 CV1430.5	Daily Lab Assessment
11	Test on roof tiles	Elevation and Sectional views and Health Centre for the given Line diagram	Lab Practical	CV1430.1 CV1430.2 CV1430.5	Daily Lab Assessment
12	Dog legged Stair case	Dog-Legged Staircase Plan and Elevation	Lab Practical	CV1430.1 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
13		Dog-Legged Staircase Elevation with section	Lab Practical	CV1430.1 CV1430.2 CV1430.4 CV1430.5	Daily Lab Assessment
14	Door Window	Plan and Elevation of Door, Window	Lab Practical	CV1430.1 CV1430.2 CV1430.4	Daily Lab Assessment

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV 1430.1	**Replicate** any furnishing details in a residential building in reality into a drawing	3				3	3			3			3	1			
CV 1430.2	**Create** a detailed building plan with elevation and cross sectional elevation.	2				3	2						3	3			
CV 1430.3	**Use** computer software like AutoCAD to convey the building drawing.					3							3	3	3		
CV 1430.4	**Learn** the procedures of submission of drawings and Develop working and submission Drawings for building					3				3			3	1		2	2
CV 1430.5	**Prepare, read** and **interpret** the drawings which will improve student skills leading to better employability.	1				2	1				2		3	2	3	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering
Department of Civil Engineering
Course Hand-out
Fluid Mechanics Lab |CV1431| 1 Credits | 0 0 2 1
Session: 2018 – 2019 (Even) | Faculty: Mr. Sagar Gupta | Class: Vth Semester B.Tech

A. INTRODUCTION: This lab course is offered by Dept. of Civil Engineering as an 5th semester course, targeting students who want to pursue a career particularly in the broad domain of hydraulics, water and water resources related technology and management and to extent for those who intends to pursue higher studies in the field of fluid dynamics related sciences and engineering, This is a beginner's experimental laboratory course for flow measurement, calibration of flow measurement devices, practical functional operation of hydro machines such as pump and types of turbines. This course is fundamentally multi-disciplinary engineering course, as such participating students are expected to have a strong background knowledge as preliminary theoretical fluid mechanics.

B. COURSE OUTCOMES: At the end of the course, students will be able to:

[CV1431.1]. Practical understanding of calibration/operation of various types of flow measurement devices such as notches, weirs, venture-meter /orifice-meters etc. and comprehend the basic and practical concept of fluid flow.

[CV1431.2]. Practical understanding of measurement/evaluation/operation of pipe flow and corresponding pipe friction factors and comprehend the basic and practical concept of fluid flow.

[CV1431.3]. To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine

[CV1431.4]. Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. PROBLEM ANALYSIS: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including preliminary prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

C. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	QUIZES (4)	20
	VIVA (4)	20
	Experiment reports submission	20
End Term Exam (Summative)	End Term Practical Exam and viva	30 +10
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup practical assignment on the experiment conducted on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked **blank**, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	A student have to work in home, especially after conducting the experiment. These works has to be submitted immediately in the next class and evaluation will be done for the same. A student is expected to participate and perform these practical assignments with full zeal since the activity participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

Calibration of V - Notch, Rectangular notch, Cippoletti Notch; Broad crested weir, curved weir; orifices, mouth pieces; Venturimeter, orifice meter; Venturi flume, standing wave flume; Determination of Friction factor of pipes; Tests on Impact of jet on Vanes, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine.

E. TEXT BOOKS

1. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics Standard Book House, New Delhi, 2005
2. Streeter V.L. and Wiley E.B, Fluid Mechanics, McGraw

F. REFERENCE BOOKS

1. Çengel Yunus A. and Cimbala John M., Fluid Mechanics Fundamentals and Applications Tata McGraw Hill Education Pvt. Limited New Delhi, 2011
2. Pritchard Philip J. and Leylegian John C., Fluid Mechanics, Wiley India Ltd. New Delhi, 2012

G. LECTURE PLAN:

Topics	Practical	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
EXPERIMENT-1 : NOTCHES To calibrate the notch (V Notch /Rectangular Notch)	2	Practical understanding of calibration/operation of various types of flow measurement devices such as notches, weirs, venture-meter /orifice-meters etc. and comprehend the basic and practical concept of fluid flow Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.1 CV1431.4	VIVA Quiz
EXPERIMENT-2 : WEIR To study the pressure distribution at the upstream of curved weir and to calibrate the same.	1	Practical understanding of calibration/operation of various types of flow measurement	Practical Demonstration		VIVA Quiz

		devices such as notches, weirs, venture-meter /orifice-meters etc. Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.			
EXPERIMENT-3 : ORIFICE METER To calibrate the orifice meter and to determine the coefficient of discharge.	1	Practical understanding of calibration/operation of various types of flow measurement devices such as notches, weirs, venture-meter /orifice-meters etc. Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.1 CV1431.4	VIVA Quiz
EXPERIMENT-4 : VENTURIMETER To calibrate the venturimeter and to determine the coefficient of discharge.	1	Practical understanding of calibration/operation of various types of flow measurement devices such as notches, weirs, venture-meter /orifice-meters etc. Be able to develop skills in critical	Practical Demonstration	CV1431.1 CV1431.4	VIVA Quiz

		thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.			
EXPERIMENT-5 : FRICTION IN PIPES (MAJOR LOSSES**)** To determine the head loss of given length of pipe.	1	Practical understanding of measurement/evaluation/operation of pipe flow and corresponding pipe friction factors and comprehend the basic and practical concept of fluid Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.2 CV1431.1	VIVA Quiz
EXPERIMENT-6 : IMPACT OF JET To study the relation between the force produce and the change of momentum when a jet strikes a vane	1	Practical understanding of measurement/evaluation/operation of pipe flow and corresponding pipe friction factors and comprehend the basic and practical concept of fluid Be able to develop skills in critical thinking and professional procedures through various forms of oral and written	Practical Demonstration	CV1431.2 CV1431.4	VIVA Quiz

		presentation through individual and group tasks.			
EXPERIMENT-7 : BERNOULI'S THEOREM To verify Bernoulli's equation experimentally.	1	Practical understanding of measurement/evaluation/operation of pipe flow and corresponding pipe friction factors and comprehend the basic and practical concept of fluid Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.2 CV1431.4	VIVA Quiz
EXPERIMENT-8 : RECIPROCATING PUMP TEST RIG To calculate the overall efficiency of the reciprocating pump	1	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.3 CV1431.4	VIVA Quiz
EXPERIMENT-9 : GEAR PUMP	1	To Understand/test and evaluation of	Practical Demonst	CV1431.	VIVA

TEST RIG Study of Gear Pump Characteristics		hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	ration	3 CV1431. 4	Quiz
EXPERIMENT-10 : HYDRAULIC RAM To study the performance of a hydraulic ram	1	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431. 3 CV1431. 4	VIVA Quiz
EXPERIMENT-11 : CENTRIFUGAL PUMP TEST RIG	1	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton	Practical Demonstration	CV1431.3 CV1431.4	VIVA Quiz

		turbine, Francis turbine and Kaplan Turbine Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.			
To calculate the overall efficiency of the pump.	1	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.3 CV1431.4	VIVA Quiz
EXPERIMENT-12 : FRANCIS TURBINE TEST RIG To determine the efficiency of the Francis Turbine	**1**	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine Be able to develop	Practical Demonstration	CV1431.3 CV1431.4	VIVA Quiz

		skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.			
EXPERIMENT-13 : PELTON WHEEL To conduct a test on Pelton Wheel Turbine at a Constant Head	1	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	Practical Demonstration	CV1431.3 CV1431.4	VIVA Quiz
Total Semester (hrs)	**14**				

H. COURSE ARTICULATION MATRIX: (MAPPING OF COS WITH POS)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES															
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	PSO 1	PSO 2	PSO 3	PSO 4
CV1431.1	Practical understanding of calibration/operation of various types of flow measurement devices such as notches, weirs, venture-meter /orifice-meters etc. and comprehend the basic and practical concept of fluid flow.	2	2	3	2	2				3			3	1		3	1
CV1431.2	Practical understanding of measurement /evaluation/ operation of pipe flow and corresponding pipe friction factors and comprehend the basic and practical concept of fluid flow.	2	2	3	2	2				3			3	1	3	3	1
CV1431.3	To Understand/test and evaluation of hydraulic machinery such as impact of jet on vanes, centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine	2	2	3	2	2				3			3	1	3	3	1
CV1431.4	Be able to develop skills in critical thinking and professional procedures through various forms of oral and written presentation through individual and group tasks.	2	2	3	2	2				3			3	1	3	3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Material Testing Lab-II | CV1432| 1 Credits | 0 0 2 1

Session: Jan 19 – May 19 | Faculty: Dr. Shaik Hussain | Class: B.Tech Civil IV SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental Lab Course, targeting students to perform different basic test on the properties of cement, sand, aggregates and concrete. It introduces the students to basic concepts and design of concrete. Students will learn how to perform the test and what are the resemblance of a particular test to the practical use of it in the field.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1432.1]. Understanding the concept of the different properties of materials
[CV1432.2]. Applying the concept to determine their properties
[CV1432.3]. Enhance entrepreneurship skill.
[CV1432.4]. Analysing and applying the properties will lead to employability
[CV1432.5]. Skills to work in groups or independently

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Assessment (Viva, Lab performance, Lab book maintenance, Punctuality in lab)	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Lab Experiments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup laboratory experiment will be performed on the topic taught on the day of absence and it will have to be performed within two weeks from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 3 throughout the entire semester.	

E. SYLLABUS

Determination of specific gravity of cement, Determination of Fineness of cement, Determination of standard consistency of cement, Determination of setting times of cement, Determination of soundness of cement, Determination of strength of cement, Determination of specific gravity of fine aggregate, Determination of specific gravity of coarse aggregate, Determination of fineness modulus of fine aggregate, Determination of fineness modulus of coarse aggregate, Determination of bulking of sand, Determination of clay (or silt) content in sand, Determination of workability of concrete by slump test, Determination of workability of concrete by compaction factor test, Determination of workability of concrete by Vee - Bee consistometer Test, Determination of compressive strength of concrete, Determination of tensile strength of concrete, Determination of flexural strength of concrete, Determination of permeability of concrete, Determination of modulus of elasticity of concrete, Determination of aggregate impact value, Determination of aggregate abrasion value (Los Angeles Test).

F. REFERENCE BOOKS

1. Shetty M.S., Concrete Technology, S. Chand and Co, 2006.
2. Neville and Brooks, Concrete Technology, Pearson Education, 2003.
3. Singh G., Materials of Construction, Std. Publishers, 1998.

G. Lecture Plan:

Lecture Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction	Introduction to Material Testing Lab-I	Lab Practical	CV1432.1	NA
2	Fineness of cement	Determination of Fineness of cement	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
3	Consistency of cement	Determination of standard consistency of cement	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
4	Soundness of cement	Determination of soundness of cement	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
5	Strength of cement	Determination of strength of cement,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
6	Specific gravity of fine aggregate,	Determination of specific gravity of fine aggregate,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
7	Specific gravity of coarse aggregate,	Determination of specific gravity of coarse aggregate,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
8	Fineness modulus of fine aggregate	Determination of fineness modulus of fine aggregate,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
9	Fineness modulus of coarse aggregate,	Determination of fineness modulus of coarse aggregate,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
10	Bulking of sand	Determination of bulking of sand,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
11	Workability of concrete	Determination of workability of concrete by slump test, Determination of workability of concrete by compaction factor test, Determination of workability of concrete by Vee - Bee consistometer Test,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
12	Compressive strength of concrete	Determination of compressive strength of concrete, Determination of tensile strength of concrete, Determination of flexural strength of concrete,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
13	Permeability of concrete	Determination of permeability of concrete, Determination of modulus of elasticity of concrete,	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment
14	Test of aggregate	Determination of aggregate impact value, Determination of aggregate abrasion value (Los Angeles Test).	Lab Practical	CV1432.2, CV1432.3, CV1432.4, CV1432.5	Daily Lab Assessment

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	
CV 1432.1	Understanding the concept of the different properties of materials	3	2										3	1	1			
CV 1432.2	Applying the concept to determine their properties	3	2				1						3	3	3	2	1	
CV 1432.3	Enhance entrepreneurship skill		2	2		3	3						3		1		3	
CV 1432.4	Analysing and applying the properties will lead to employability		3	3		3	2						3	2	3		3	
CV 1432.5	Skills to work in groups or independently									3			3			3	3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Signatures

Course Instructor(s) **Head of Department**

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Engineering Geology Laboratory Practices| CV 1433 | 1 Credit | 0 0 2 1

Session: January – May 2019 | Faculty: Dr Harshavardhana B G | Class: Regular

A. Introduction: This course is offered by Dept. of Civil Engineering as a Regular Course, to support students for gaining the practical knowledge of identifying different variety of minerals and rocks. The course introduces the application of Brunton Compass to explore the dip and strike of a rock-bed in the field. Demarcation of rock outcrop from the contour- and geological- maps, their profiling with an estimation and mapping of inclined beds would strengthen and supplement the theoretical knowledge of Geology learnt in the earlier semester. This would also help students understand the importance of different geological structures before undertaking construction.

B. Course Outcomes: At the end of the course, students will be able to

[CV1433.1]. Apply the fundamental knowledge of physical properties of minerals and rocks for their identification, which helps to decide on the type of rock needed for the construction. This practical knowledge, along with the theoretical knowledge of the subject would increase the employability.

[CV1433.2]. Discern geological/contour/topographic maps and extract necessary information related to the thickness and attitude of a rock outcrop.

[CV1433.3]. Understand the importance of the subsurface geological structures and their attitudes while planning civil constructions. This allows them to incorporate suitable measures while providing solutions to the problems associated with geological structures and thus, help for an entrepreneurship.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Assignment + Record + Lab Performance + Viva	60
End Term Exam (Summative)	Performance in exam + viva	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Student who misses a class will have to report to the teacher about the absence. A makeup assignment (which will be considered only for attendance) on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments	

	with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

E. Syllabus:

Identification and description of the following minerals with uses and distribution in India. Rock forming Minerals: Quartz group - rock crystal, Amethyst, Rose crystal, agate, flint, Jasper, Orthoclase, Microcline, Plagioclase, Muscovite, Biotite, Koaline, Calcite, Magnesite, Dolomite, Hornblende, gypsum, Olivine, Corundum, Garnet, Talc, Asbestose, Chlorite. Ore minerals: hematite, Magnetite, Limonite, Chromite, Chalcopyrite, Pyrite, Galena, Azurite, Malacite. Megascopic study of the following rocks with their composition, texture, structure, and engineering importance- Granite, gabro, dunite, pegmatite, dolomite, basalt, obsidian, pumice, conglomerate, breccia, sandstone, limestone, shale, laterite, gneiss, slate, quartzite and marble. Interpretation of geologic maps with horizontal inclined, folded, faulted and unconformity. Determination of thickness of strata on horizontal ground, Dip and strike problems, Borehole problems and their uses in dams, tunnels and reservoir site.

References:

1. Reddy M.T.M., Engineering Geology Practicals, New Age International Publishers, New Delhi 2002.
2. Gurappa K.M., Structural Geology Maps and Problems, 1975.
3. Gokhale W., Manual of Geological Maps, CBS publications, New Delhi 1987.

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Formation of flow chart for minerals identification	Understand the relation of minerals with their physical properties	Practical session with mineral samples in lab	CV1433.1	Viva while practical session
2	Identification and description of Silicate Minerals	Mineral identification through their properties			
3	Identification and description of Non-Silicate Minerals – Oxide and Sulphide group				
4	Identification and description of Non-Silicate Minerals – Halide, carbonate & sulphate group				
5	Formation of Flow chart for Rock identification	Understand the relation of minerals with their physical properties	Practical session with rock samples in lab	CV1433.1	Viva while practical session
6	Identification and description of Igneous rocks				
7	Identification and description of Sedimentary rocks				
8	Identification and description of Metamorphic rocks				

9	Determination of thickness of subsurface strata	Calculation of the attitude of subsurface geological formations	Practical session	CV1433.2 and CV1433.3	Viva while practical session
10	Dip and strike problem - Determination of true dip using apparent dip values				
11	Dip and strike problem - Determination of true dip using apparent dip values and strike				
12	Dip and strike problem - Determination of apparent dip using true dip				
13	Determination of trend of a strata from the geological map				
14	Developing a cross section of given topographical map				

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1433.1	Apply the fundamental knowledge of physical properties of minerals and rocks for their identification, which helps to decide on the type of rock needed for the construction.	3	2	1	1	1	1	2	1	1	1	1	3	1	1	1	1
CV1433.2	Discern geological/contour/topographic maps and extract necessary information related to the thickness and attitude of a rock outcrop.	3	2	1	1	1	1	1	1	1	1	1	3	1	2	1	1
CV1433.3	Understand the importance of the subsurface geological structures and their attitudes while planning civil constructions. This allows them to incorporate suitable measures while providing solutions to the problems associated with geological structures.	3	3	2	1	1	2	2	1	1	1	1	3	3	1	1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY
JAIPUR

School of Civil and Chemical Engineering

Course Hand-out

Geotechnical Engineering-I
| CV 1501 | 4 Credits | 3 1 0 4

Session: 2018-19 (odd Sem.) | Faculty: Dr. Arvind Kumar Jha | Class: B.Tech IIIrd Year

A. Introduction: This course is offered by Dept. of Civil Engineering as a departmental core course. The main objectives of this course are to understand, determine and analyses the physical and engineering properties of soils. The course covers index properties of soils, classification of soils, soil structure, clay mineralogy, and movement of water through soils, stresses in soil mass, seepage analysis, compaction, soil improvement and shear strength of soils. Further, the course also includes the laboratory and field determination of various properties of soils and interpretation/presentation of results. Overall, this course will help to solve the complex geotechnical engineering problem and to handle the various civil engineering projects.

B. Course Outcomes: At the end of the course, students will be able to

[CV1501.1]. Realize the importance of geotechnical engineering in civil engineering construction.

[CV1501.2]. Identify the basic properties and mineralogy in soils for prediction and analyses of its engineering properties.

[CV1501.3]. Investigate the suitability of soils and its improvement techniques for structures to be constructed.

[CV1501.4]. Determine the properties of soils and its critical evaluation for design and construction of civil engineering structures.

[CV1501.5]. Apply the knowledge to handle the various geotechnical projects independently/or, in group to develop self-employment and entrepreneurship among learner.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering

practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments, Projects/Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/Quizzes/ Activity Assignment (Formative)	There are situations where a student may have to work in home, the scheduled and grading of these works will be decided by course instructor. However, a student is expected to participate and perform these assignments with full zeal as per academic plan prepared by instructor.	

E. SYLLABUS

Introduction: definition, historical development of soil mechanics, origin and classification of soils: transported soils, residual soils, alluvium, colluviums; Basic Definitions and Relationships: phase relationship of soil: two and three phase diagram, basic definitions: specific gravity, volume relationships (void ratio, porosity, degree of saturation, air void and air content), weight relationships (water content, densities/unit weights), weight-volume inter-relationships; Determination of Index Properties: water content, specific gravity, particle size distribution by sieve and sedimentation analysis, consistency limits, void ratio and density index, field identifications: density of undisturbed soils; sensitivity, thixotropy and activity of clays; Classification of Soils: introduction, gradation of soil and its importance, particle size classification: USBS and PRA Classification, International Classification, MIT Classification, Textural Classification, Highway Research Board Classification, AASHO Classification, Unified Soil Classification and Indian Standard Classification, Classification based on shapes; Soil Structure and Clay Mineralogy: introduction, inter-particle forces, classification of soil structure, single grained, honey combed, flocculent and dispersed structure, clay minerals: kaolinite, montmorillonite and illite and their properties; Flow through Soils: soil water: free or gravitation water, held water, structural water, adsorbed water and capillary water. permeability: Darcy's law of permeability, factors effecting permeability, laboratory determination of permeability: constant and variable head methods, field determination of permeability: pumping in and pumping out test for confined and unconfined strata, permeability of stratified soil deposits; Stress in Soil Mass: stresses within a soil: total, effective and neutral stress, effective stress principle, stress point and stress path, calculation of stresses, soil-water systems-capillarity, quick sand phenomenon; Seepage Analysis: introduction: seepage forces, flow net and its elements, boundary conditions, graphical method of flow net construction, one dimensional and two dimensional flow, Laplace equation, stream and potential functions, uses of flow net, Casagrande and analytical method to determine phreatic line of an earthen dam, design of filters; Compaction of Soils: definition and objectives, theory of compaction, laboratory compaction tests: proctor and modified proctor test, factors effecting compaction, effect of compaction on soil properties, placement water content, placement layer thickness, methods of compaction and types of equipment used in field, field control of compaction, Proctor's needle; Shear Strength of Soils: introduction, shear resistance of soil, principle stresses, Mohr's circle, Mohr's strength theory, Mohr- coulomb's strength theory, determination of shear strength parameters: direct shear test, unconfined compression test, vane shear test, tri-axial shear test, typical stress-stain curves for soils, typical failure envelopes for cohesionless soils and normally consolidated clay soils, critical void ratio..

F. Text Books

T1. Murthy, V. N. S., "Soil Mechanics and Foundation Engineering: A Book for Students and Practising Engineers", Dhanpat Rai, 1977.

T2. K. R, Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005.

G. Reference Books

R1. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications, 6th edition, 2005.
R2. Ranjan G. and Rao A.S.R., "Soil Mechanics and Foundation Engineering", New Age International Publisher, New Delhi, 2006.

H. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Definition, Historical development of soil mechanics	To provide background information about development of subject	Lecture	CV1501.1	Mid Term I, End Term Quiz; Assignment; Class Test, Project work

2	Origin and Classification of soils: transported soils, residual soils, alluvium, colluviums.	To realize the importance of geotechnical engineering in civil engineering construction.	Lecture	CV1501.1; CV1501.2	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
3	Phase relationship of soil: Two and three phase diagram, Basic definitions: specific gravity, volume relationships (void ratio, porosity, degree of saturation, air void and air content) Weight relationships (water content, densities/unit weights)	To introduce the basic terminologies of soil mechanics	Lecture	CV1501.2; CV1501.4	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
4	Weight-volume inter-relationships	To derive the interrelation between various properties of soils	Lecture	CV1501.2; CV1501.4	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
5	Weight-volume inter-relationships	To derive the interrelation between various properties of soils	Lecture	CV1501.2; CV1501.4	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
6	Numerical practice and exercises	To solve the practical problem of phase relations of soil	Tutorial	CV1501.2; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
7	Numerical practice and exercises	To solve the practical problem of phase relations of soil	Tutorial	CV1501.2; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
8	Water content, specific gravity	To explain about determination of index properties	Lecture	CV1501.3; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
9	Particle size distribution by sieve and sedimentation analysis	To explain about determination of index properties	Lecture	CV1501.4; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
10	Consistency limits, void ratio and density index	To explain about determination of index properties	Lecture	CV1501.3; CV1501.4; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
11	Field identifications: density of undisturbed soils; Sensitivity,Thixotropy and Activity of clays	To explain about determination of index properties	Lecture	CV1501.3; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work

12	Numerical practice and exercises	To solve the practical problem of determination of index properties	Tutorial	CV1501.4; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
13	Numerical practice and exercises	To solve the practical problem of determination of index properties	Tutorial	CV1501.4; CV1501.5	Mid Term I, End Term Quiz; Assignment; Class Test, Project work
14	Introduction, Gradation of soil and its importance, Particle size classification: USBS and PRA Classification	To introduce about various soil classification system	Lecture	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
15	International Classification, MIT Classification, Textural Classification, Highway Research Board Classification	To introduce about various soil classification system	Lecture	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
16	AASHO Classification, Unified Soil Classification and Indian Standard Classification, Classification based on shapes	To introduce about various soil classification system	Lecture	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
17	Numerical Exercises	To practice the problems for classifying the soils	Tutorial	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
18	Introduction, inter-particle forces, classification of soil structure, single grained, honey combed, flocculent and dispersed structure.	To acquaint with formation of clay mineral and its properties	Lecture	CV1501.2; CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
19	Clay minerals: Kaolinite, Montmorillonite and Illite	To acquaint with formation of clay mineral and its properties	Lecture	CV1501.2; CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
20	Properties of clay minerals	To acquaint with formation of clay mineral and its properties	Lecture	CV1501.2; CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
21	Soil water: free or gravitation water, held water, structural water, adsorbed water and capillary water	To familiarize with various types of soil-water	Lecture	CV1501.3; CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
22	Permeability: Darcy's law of permeability, factors effecting permeability	To know the movement of	Lecture	CV1501.3; CV1501.4	Mid Term II, End Term Quiz;

		water through soils			Assignment; Class Test, Project work
23	Laboratory determination of permeability: constant and variable head methods	To determine the hydraulic conductivity of soils	Lecture	CV1501.3; CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
24	Field determination of permeability: pumping in and pumping out test for confined and unconfined strata, Permeability of stratified soil deposits	To know the filed determination of permeability of soils	Lecture	CV1501.4; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
25	Numerical Exercises	To practice of solving problems related to permeability of soils	Tutorial	CV1501.4; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
26	Numerical Exercises	To practice of solving problems related to permeability of soils	Tutorial	CV1501.4; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
27	Stresses within a soil: total, effective and neutral stress, effective stress principle, stress point and stress path	To understand the different stresses caused due to water within soils	Lecture	CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
28	Calculation of stresses, soil-water systems-capillarity, quick sand phenomenon	To calculate the hydrostatics stresses within soils mass	Lecture	CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
29	Numerical Exercises	To practice of solving problems related to stresses	Tutorial	CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
30	Introduction: seepage forces, flow net and its elements, boundary conditions	To explain about the background of pressures caused due to seepage of water through soils	Lecture	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work
31	Graphical method of flow net construction, One dimensional and two dimensional flow	To evaluate the seepage pressures	Lecture	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work
32	Laplace Equation, stream and potential functions, uses of flow net	To derive the equation to get seepage pressures	Lecture	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work

33	Casagrande and analytical method to determine phreatic line of an earthen dam, Design of filters	To evaluate the seepage pressures	Lecture	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work
34	Numerical Exercises	To practice of solving problems related to seepage pressure	Tutorial	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work
35	Numerical Exercises	To practice of solving problems related to seepage pressure	Tutorial	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work
36	Definition and objectives, Theory of compaction, Laboratory compaction tests: Proctor and Modified Proctor test	To get the idea about densification of soils	Lecture	CV1501.3; CV1501.4	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
37	Factors affecting compaction, Effect of compaction on soil properties	To know about the compaction and related changes in soil properties	Lecture	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
38	Placement water content, Placement layer thickness	To understand the compaction control	Lecture	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
39	Methods of compaction and types of equipment used in field, Field control of compaction, Proctor's needle.	To understand the methods of compaction	Lecture	CV1501.3; CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
40	Numerical Exercises	To solve the critical problem to determine compaction characteristics	Tutorial	CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
41	Numerical Exercises	To solve the critical problem to determine compaction characteristics	Tutorial	CV1501.5	Mid Term II, End Term Quiz; Assignment; Class Test, Project work
42	Introduction, shear resistance of soil, principle stresses, Mohr's circle	To know about the shear strength of soils	Lecture	CV1501.2; CV1501.3	End Term Quiz; Assignment; Class Test, Project work
43	Mohr's strength theory, Mohr-coulomb's strength theory	To understand the theory behind the shear strength of soil	Lecture	CV1501.1; CV1501.2	End Term Quiz; Assignment; Class Test, Project work

44	Determination of shear strength parameters: Direct Shear Test,	To determine the shear strength parameters in laboratory	Lecture	CV1501.3; CV1501.4	End Term Quiz; Assignment; Class Test, Project work
45	Unconfined Compression Test, Vane Shear Test	To determine the shear strength parameters in laboratory	Lecture	CV1501.3; CV1501.4	End Term Quiz; Assignment; Class Test, Project work
46	Tri-axial Shear Test	To determine the shear strength parameters in laboratory	Lecture	CV1501.3; CV1501.4	End Term Quiz; Assignment; Class Test, Project work
47	Typical stress-stain curves for soils	To determine the shear strength parameters	Lecture	CV1501.3; CV1501.4	End Term Quiz; Assignment; Class Test, Project work
48	Numerical Exercises	To calculate the shear strength parameters by various approach	Tutorial	CV1501.4; CV1501.5	End Term Quiz; Assignment; Class Test, Project work

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

COs	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1501.1	Realize the importance of geotechnical engineering in civil engineering construction.	3					2							1		1	
CV1501.2	Identify the basic properties and mineralogy in soils for prediction and analyses of its engineering properties.	2	3	1									1	1	2		
CV1501.3	Investigate the suitability of soils and its improvement techniques for structures to be constructed.	2	2	1	3								1	1	3	1	
CV1501.4	Determine the properties of soils and its critical evaluation for design and construction of civil engineering structures.	2	3	2	1								2	1	2		
CV1501.5	Apply the knowledge to handle the various geotechnical projects independently/or, in group to develop self-employment and entrepreneurship among learner.	2	2	2	2		1			1	1		2	1	2	3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Environmental Engineering I | CV1504| 1 Credits | 3 1 0 4

Session: July 18 – Nov 18 | Faculty: Prof. R. C. Gaur | Class: Environmental Engineering I

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental Laboratory Course, targeting students who wish to work in the field of environmental engineering. The first part deals with quality and quantity of water. In all it deals with quality and quantity of water. Conventional and advanced treatment methods are considered. The design of distribution system is there. The second part deals with Air and noise pollution along with effect of air pollutants.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1504.1] Comprehend about different quality parameters of water and water demand.
[CV1504.2] Design of Sources and Transmission of water.
[CV1504.3] Understand the various treatment systems of water and distribution system.
[CV1504.4] Analysis of effect of Air and noise pollution.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Design economic, environment friendly, sustainable Civil engineering structures keeping in view national and social requirements.

[PSO.2] Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex Civil engineering problem.

[PSO.3] Manage/ execute Civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4] Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

CV1504 **ENVIRONMENTAL ENGINEERING –I** **[3 1 0 4]**

Introduction, Water demand, Population forecasting methods, Factors affecting water consumption, Variation in water demand, Design capacities for various water supply components. Source of water and water collection works. Water quality requirements, Transmission of water. Preliminary treatment of water, Water treatment processes Design of sedimentation, Coagulation, feeding mixing devices, flocculation-design consideration, other treatment, processes. Secondary treatment of water: Filtration-types of filters, Design of filters, Dissolved solids removal, Treatment plant design, Preparation of hydraulic profiles, Disinfection-theory, methods of disinfection, chlorination. Advance treatment of water. Design of distribution systems, Hydraulic analysis of distribution systems. Design of plumbing system. Air and noise pollution: Sources and types of air pollutants, Effect of air pollutants and Economic aspects, Greenhouse effect, Acid rain. Noise pollution and control.

References:

1. S.K. Garg, "*Environmental Engg.-I*", Khanna Publishers, New Delhi, 2012.
2. G.S. Birdie, "*Water Supply and Sanitary Engineering*", Dhanpath Rai and Sons, New Delhi, 2012.
3. B.C. Punmia, "*Water Supply and Sanitary Engg.*", Dhanpath Rai and Sons, New Delhi, 2010

4. Modi and Sethi, "*Water Supply and Sanitary Engg.*", Dhanpath Rai and Sons, New Delhi, 2010

BIS Publications:

1. Manual on water supply and treatment CPHEEO, Ministry of Urban development, New Delhi, 1991.

Lecture Plan:

A. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	General definitions and introduction to subject	To acquaint knowledge about basics of subject	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
2	General definitions and introduction to subject	To acquaint knowledge about basics of subject	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
3	Water demand. Variations in demand	Describing Water Demand	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
4	Water demand. Variations in demand	Variations Demand	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
5	Factors affecting water demand	Different Parameters	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
6	Factors affecting water demand	Different Parameters	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
7	Design capacities of water supply components.	Design capacities	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
8	Design capacities of water supply components.	Design capacities	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
9	Population forecasting methods and numerical	numerical	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
10	Population forecasting methods and numerical	numerical	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
11	Population forecasting methods and numerical	Comparison of Various methods	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
12	Sources of water and their comparison	Ground water and surface water	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
13	Sources of water and their comparison	Comparison of sources	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
14	Water quality parameters	Physical Parameter	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
15	Water quality parameters	Chemical Parameters	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term

16	Water quality parameters	Bacteriological parameters	Lecture	**[CV1504.1]**	Mid Term I, Quiz & End Term
17	Design of conveying mains and type of pipes, joints	Design of rising man	Lecture	**[CV1504.2]**	Mid Term I, Quiz & End Term
18	Design of conveying mains and type of pipes, joints	Design of distribution	Lecture	**[CV1504.2]**	Mid Term II, Quiz & End Term
19	Design of conveying mains and type of pipes, joints	Pipe types	Lecture	**[CV1504.2]**	Mid Term II, Quiz & End Term
20	Preliminary treatment of water	Screening	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
21	Preliminary treatment of water	Sedimentation	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
22	Theory of sedimentation and numerical on settling velocity	Numerical	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
23	Theory of sedimentation and numerical on settling velocity	Settling Velocity	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
24	Theory of sedimentation and numerical on settling velocity	Theory of sedimentation	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
25	Coagulation, Flocculation	Coagulation	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
26	Coagulation, Flocculation	Alum as coagulant	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
27	Coagulation, Flocculation	Clarifloculator	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
28	Filtration, type of filters	Theory of filtration	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
29	Filtration, type of filters	Filtration	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
30	Filtration, type of filters	Types of filters	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
31	Slow sand and Rapid gravity sand filters, comparison	Slow and rapid Sand filters	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
32	Slow sand and Rapid gravity sand filters, comparison	comparison	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
33	Slow sand and Rapid gravity sand filters, comparison	Hydraulic Design	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term

34	Treatment plant hydraulic design	Profile and Head loss	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
35	Treatment plant hydraulic design	Case study Mansi Vakal plant	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
36	Disinfection, chlorination, residual chlorine	Dis infection	Lecture	**[CV1504.3]**	Mid Term II, Quiz & End Term
37	Disinfection, chlorination, residual chlorine	Chlorination	Lecture	**[CV1504.3]**	Quiz & End Term
38	Disinfection, chlorination, residual chlorine	Residual Chlorine	Lecture	**[CV1504.3]**	Quiz & End Term
39	Design of distribution system, Hardy Cross method	Design of pipe lines	Lecture	**[CV1504.3]**	Quiz & End Term
40	Design of distribution system, Hardy Cross method	Hardy Cross method	Lecture	**[CV1504.3]**	Quiz & End Term
41	Advanced treatment of water	Removal of phosphorus	Lecture	**[CV1504.3]**	Quiz & End Term
42	Advanced treatment of water	Removal of nitrogen	Lecture	**[CV1504.3]**	Quiz & End Term
43	Plumbing systems	House Connection	Lecture	**[CV1504.3]**	Quiz & End Term
44	Plumbing systems	House drainage system	Lecture	**[CV1504.3]**	Quiz & End Term
45	Air and Noise pollution	Air pollutants	Lecture	**[CV1504.4]**	Quiz & End Term
46	Air and Noise pollution	Secondary air pollutant	Lecture	**[CV1504.4]**	Quiz & End Term
47	Air and Noise pollution	SPM	Lecture	**[CV1504.4]**	Quiz & End Term
48	Effects of air pollutants	Effect of human beings	Lecture	**[CV1504.4]**	Quiz & End Term
49	Effects of air pollutants	Effect on vegetation, buildings	Lecture	**[CV1504.4]**	Quiz & End Term
50	Effects of air pollutants	Mitigation	Lecture	**[CV1504.4]**	Quiz & End Term
51	Sources and types of Air pollutants	Sox (Nox)	Lecture	**[CV1504.4]**	Quiz & End Term
52	Sources and types of Air pollutants	Line source	Lecture	**[CV1504.4]**	Quiz & End Term
53	Sources and types of Air pollutants	Stationary source	Lecture	**[CV1504.4]**	Quiz & End Term
54	Greenhouse effect, Acid rain,	Green house	Lecture	**[CV1504.4]**	Quiz & End Term
55	Greenhouse effect, Acid rain,	Acid rain	Lecture	**[CV1504.4]**	Quiz & End Term
56	Greenhouse effect, Acid rain,	Global Warming	Lecture	**[CV1504.4]**	Quiz & End Term

1. **Course Articulation Matrix: (Mapping of COs with POs)**

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	
CV 1504.1	Comprehend about different quality parameters of water and water demand.	3	2		2								2		2			
CV 1504.2	Design of Sources and Transmission of water	2		3	3	2	1						3		3	1		
CV 1504.3	Understand the various treatment systems of water and distribution system	2			2	2	3	3		1					3			
CV 1504.4	Analysis of effect of Air and noise pollution.				2	3	1			3	2	3			2	2	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Transportation Engineering - I | CV1505 | 4 Credits | 4 0 0 4

Session: July 18 – November 18 | Faculty: Sanchit Anand | Class: B.Tech , 3rd Year

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course, targeting students who wish to pursue their career in the field of highway design and construction or go for higher studies in the field of Transportation Engineering. The course offers in depth knowledge of Highway Engineering, Traffic management and design, Highway Safety and Accident studies. Various highway materials used for construction, conventional design of various types of pavements, economics involved in Highway construction and management have been emphasized in this course. Students are expected to have a prerequisite knowledge of general physics for geometric design, building materials for highway materials and Surveying for Highway Alignment.

B. Course Outcomes: At the end of the course, students will be able to:

CV1505.1 Identify possible highway alignment between given origin and destination

CV1505.2 Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways

CV1505.3 Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector

CV1505.4 Conduct the quality assurance of various highway materials through different tests and identify new materials that could be used for sustainable construction of highways in order to promote entrepreneurship

CV1505.5 Design traffic signals and manage traffic management projects and operations in urban areas

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction

Highway classifications, design of road length as per 20 year plans

Geometric design

Sight distance-stopping and overtaking, horizontal curve, extra widening. Super elevation, transition curve, vertical curves-summit and valley Curves, design problems, design of cross drainage structures.

Pavement materials

Tests on different highway materials, Soil-CBR and Plate load test, Bitumen, Difference between tar and bitumen

Design of pavements

Design of flexible pavements, rigid pavement design, stresses in rigid pavement, joints and failures of rigid pavement.

Highway economics and finance

Methods of Economic Analysis-benefit cost ratio, net present value method. Transport planning.

Traffic engineering

Traffic engineering, vehicular and road user characteristics. Traffic studies, relation between speed, travel time and traffic volume. Traffic density and passenger car units, traffic signs and traffic signals, design of traffic signals. Accident studies- overview, objectives, causes, accident analysis and road safety.

F. TEXT BOOKS

1. *Highway Engineering, S.K Khanna, CEG Justo, A. Veeraragavan, 10th Edition, Nem Chand Bros.*
2. *Traffic and transport planning, L.R Kadiyali*

G. REFERENCE BOOKS

1. *Highway and Traffic Engineering, Subhash C Saxena, CBS Publishers*
2. *Transportation Engineering and Planning, C.S Papacostas, P.D. Prevedouros, PHI Learning*
3. *Transportation Engineering, Volume 1: Highway Engineering, C Venkatramaiah*
4. *Highway Engineering, 7th Edition, Wright and Dixon, Wiley Publication*

H. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Importance of Types of Transportation	Identify possible highway alignment between given origin and destination	Lecture	CV1505.1	Mid Term I, Quiz & End Term
2	Current road development programmes in India	Identify possible highway alignment between given origin and destination	Lecture	CV1505.1	Mid Term I, Quiz & End Term
3	Development of road construction in world	Identify possible highway alignment between given origin and destination	Lecture	CV1505.1	Mid Term I, Quiz & End Term
4	1st,2nd ,3rd 20 year road development plan in India	Identify possible highway alignment between given origin and destination	Lecture	CV1505.1	Mid Term I, Quiz & End Term
5	Highway Alignment	Identify possible highway alignment between given origin and destination	Lecture	CV1505.1	Mid Term I, Quiz & End Term
6	Engineering surveys for highway alignment	Identify possible highway alignment between given origin and destination	Outdoor Activity	CV1505.1	Mid Term I, Quiz & End Term
7	Engineering surveys for highway alignment	Identify possible highway	Lecture	CV1505.1	Mid Term I, Quiz & End Term

		alignment between given origin and destination			
8	Geometric design and importance of it	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Lecture	CV1505.2	Mid Term I, Quiz & End Term
9	Stopping sight distance	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Lecture	CV1505.2	Mid Term I, Quiz & End Term
10	Overtaking sight distance(ISD & HSD also)	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Lecture	CV1505.2	Mid Term I, Quiz & End Term
11	Pavement unevenness and camber	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Lecture	CV1505.2	Mid Term I, Quiz & End Term
12	Other cross sectional elements	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe	Lecture	CV1505.2	Mid Term I, Quiz & End Term

		and convenient highways			
13	Design of horizontal curves	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Activity	CV1505.2	Mid Term I, Quiz & End Term
14	Super elevation and its design	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Lecture	CV1505.2	Mid Term I, Quiz & End Term
15	Widening of pavement at curves	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	Lecture	CV1505.2	Mid Term I, Quiz & End Term
16	Highway materials(Soil)	Learning the quality control of highway materials	Lecture	CV1505.4	Mid Term I, Quiz & End Term
17	Highway materials(Aggregates)	Learning the quality control of highway materials	Lecture	CV1505.4	Mid Term I, Quiz & End Term
18	Highway materials(Bitumen)	Learning the quality control of highway materials	Lecture	CV1505.4	Mid Term II, Quiz & End Term
19	Design elements and criteria	Apply modern engineering and IT tools to design and construct various kinds of pavements	Lecture	CV1505.3	Mid Term II, Quiz & End Term

		for highways and urban roads to enhance employability in Highway sector			
20	Flexible pavement and its components	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
21	Factors affecting design and performance of pavement	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
22	Elastic layer system	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
23	CBR method of pavement design	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways	Lecture	CV1505.3	Mid Term II, Quiz & End Term

		and urban roads to enhance employability in Highway sector			
24	IRC method of pavement design	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
25	Components of Rigid pavement	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
26	Stresses in Rigid pavement	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
27	Design of dowel and tie bars	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban	Lecture	CV1505.3	Mid Term II, Quiz & End Term

		roads to enhance employability in Highway sector			
28	Highway construction(Embankment)	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
29	Granular subbase and Base layer(WBM,WMM)	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
30	Binder and surface layer	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
31	CC pavement and its construction	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to	Lecture, Activity	CV1505.3	Mid Term II, Quiz & End Term

		enhance employability in Highway sector			
32	Highway construction(Embankment)	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
33	Granular subbase and Base layer(WBM,WMM)	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
34	Binder and surface layer	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture, Activity	CV1505.3	Mid Term II, Quiz & End Term
35	Highway Economics and Finance	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance	Lecture	CV1505.3	Mid Term II, Quiz & End Term

		employability in Highway sector			
36	Net present value method and numericals	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Mid Term II, Quiz & End Term
37	Cost Benefit ratio method	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Quiz & End Term
38	Numericals on CBR method	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	Lecture	CV1505.3	Quiz & End Term
39	Transport planning	Design traffic signals and manage traffic management projects and operations in urban areas	Lecture	CV1505.5	Quiz & End Term
40	Traffic(Road user and vehicular characteristics)	Design traffic signals and manage traffic management	Lecture	CV1505.5	Quiz & End Term

		projects and operations in urban areas			
41	Traffic Engineering studies and analysis	Design traffic signals and manage traffic management projects and operations in urban areas	Lecture	CV1505.5	Quiz & End Term
42	Origin and destination survey and accident analysis	Design traffic signals and manage traffic management projects and operations in urban areas	Lecture	CV1505.5	Quiz & End Term
43	Continued	Design traffic signals and manage traffic management projects and operations in urban areas	Lecture	CV1505.5	Quiz & End Term
44	Passenger car unit	Design traffic signals and manage traffic management projects and operations in urban areas	Lecture	CV1505.5	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	
CV1505.1	Identify possible highway alignment between given origin and destination	3	3	1	3	3		1	2		2			2	3	2	1	
CV1505.2	Apply the knowledge of mathematics, science, engineering fundamentals for geometric design for safe and convenient highways	3	2	3	2	3		1		1				2			2	
CV1505.3	Apply modern engineering and IT tools to design and construct various kinds of pavements for highways and urban roads to enhance employability in Highway sector	3	1	3	3					1	1	2	2	3	2	2		
CV1505.4	Conduct the quality assurance of various highway materials through different tests and identify new materials that could be used for sustainable construction of highways in order to promote entrepreneurship				3	2		2	2				2	3	2	1		
CV1505.5	Design traffic signals and manage transport planning projects and operations in urban areas	1	0	2	1	1	2	2	1	0	0	3	0	1	0	2	0	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Signature: -

Course Instructor **Class Representative (s)** **Head of Department**

MANIPAL UNIVERSITY
JAIPUR

School of Civil and Chemical Engineering

Course Hand-out

Geotechnical Engineering Laboratory
| CV 1530 | 4 Credits | 0 0 2 1

Session: 2018-19 (odd Sem.) | Faculty: Dr. Arvind Kumar Jha| Class: B.Tech IIIrd Year

A. Introduction: This course is offered by Dept. of Civil Engineering as a departmental core course. The course covers a detailed laboratory testing by using various method as per standard test procedures to determine and understand the physical and engineering properties of soils for design of different civil engineering construction projects.

B. Course Outcomes: At the end of the course, students will be able to

[CV1530.1]. Determine physical properties of soil.
[CV1530.2]. Determine the index properties of natural soils.
[CV1530.3]. Understand the compaction control in the field.
[CV1530.4]. Determine shear strength and compressibility characteristics of soil.
[CV1530.5]. Apply the knowledge to handle the various geotechnical projects independently/or, in group to develop self-employment and entrepreneurship among learner.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	-
	Sessional Exam II (Close Book)	-
	Online quiz, class exam, viva, discipline, report writing	60
End Term Exam (Summative)	Live test, report writing, viva with external	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. If student missed any quizzes and class tests, he/she will be allowed to appear only one substitute quiz and class test.	

E. SYLLABUS

Determination of water content, specific gravity, particle size distribution of coarse and fine grained soil, Atterberg's limits of soil. Determination of dry density of natural soil. Determination of compaction characteristics (optimum moisture content and maximum dry density of soil) using standard proctor method and modified proctor method. Determination of California Bearing Ratio (CBR) of soil in dry and wet condition. Determination of Unconfined Compressive Strength (UCS) of soil. Determination of shear strength parameters of soil using direct shear test. Determination of shear strength of clay by using Vane shear test. Determination of the coefficient of permeability of soils by constant and falling head method. Determination of shear strength parameters of soils using Triaxial tests. Determination of compressibility characteristics of soil by using one dimensional oedometer test.

F. Text Books

T1. Indian Standard codes practices for soil testing.
T2. K. R, Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005.

G. Reference Books

R1. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications, 6th edition, 2005.
R2. Ranjan G. and Rao A.S.R., "Soil Mechanics and Foundation Engineering", New Age International Publisher, New Delhi, 2006.

H. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Determination of water content of soils by oven drying method and rapid moisture meter method	To provide background information about development of subject	Practical	CV1530.1; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
2	Determine specific gravity of soils using pycnometer method	To realize the importance of geotechnical engineering in civil engineering construction.	Practical	CV1530.1; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
3	Determine particle size distribution of coarse and fine grained soil using by dry and wet sieve analysis	To introduce the basic terminologies of soil mechanics	Practical	CV1530.1; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
4	Determine particle size distribution of fine grained soil using hydrometer method	To derive the interrelation between various properties of soils	Practical	CV1530.1; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
5	Determine the Atterberg's limits of soil by Casagrande's method and cone penetration method	To derive the interrelation between various properties of soils	Practical	CV1530.2; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
6	Determine the Plastic limit of soil	To solve the practical problem of phase relations of soil	Practical	CV1530.2; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
7	Determine the Shrinkage limit of soil	To solve the practical problem of phase relations of soil	Practical	CV1530.2; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external

8	Determine dry density of natural soil by a) Sand replacement method b) Core cutter method	To explain about determination of index properties	Practical	CV1530.3; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
9	Determine compaction characteristics (optimum moisture content and maximum dry density of soil) using a) Standard proctor method b) Modified proctor method	To explain about determination of index properties	Practical	CV1530.3; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
10	Determine California Bearing Ratio (CBR) of soil a) Dry condition b) Wet condition	To explain about determination of index properties	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
11	Determine Unconfined Compressive Strength (UCS) of soil	To explain about determination of index properties	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
12	Determine shear strength parameters of soil using direct shear test	To solve the practical problem of determination of index properties	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
13	Determine shear strength of clay by using Vane shear test	To solve the practical problem of determination of index properties	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
14	Determine the coefficient of permeability of soils by a) Constant head method b) Falling head method	To introduce about various soil classification system	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
15	Determine shear strength parameters of soils using Triaxial tests	To introduce about various soil classification system	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
16	Determine compressibility characteristics of soil by using one dimensional oedometer test	To introduce about various soil classification system	Practical	CV1530.4; CV1530.5	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

COs	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1530.1	Determine physical properties of soil.	2	2	2	1	1			1	1			2		3	1	
CV1530.2	Determine the index properties of natural soils.	2	2	2	1	1			1	1			2		3	1	
CV1530.3	Understand the compaction control in the field.	2	2	2	1	1			1	1			2		3	1	
CV1530.4	Determine shear strength and compressibility characteristics of soil.	2	2	2	1	1			1	1			2		3	1	
CV1530.5	Apply the knowledge to handle the various geotechnical projects independently/or, in group to develop self-employment and entrepreneurship among learner.	2	2	2	2				1	2	2		2	1	2	2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Environmental Engineering Laboratory-I | CV1532 | 1 Credits | 0 0 3 1

Session: 2018 –2019 (ODD) | Faculty: Mr. Kamal Kumar | Class: B.Tech

A. Course Outcomes: At the end of the course, students will be able to:

[CV1532.1]. Applying knowledge to classify and analysing various water quality parameters.

[CV1532.2]. Analysing various physio-chemical and biological parameters of water and wastewater.

[CV1532.3]. Understanding the importance of advance waste treatment technologies with functional design of low-cost treatment systems used in rural areas for the sake of waste management.

[CV1532.4]. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning.

B. SYLLABUS

Analysis of water/wastewater for physicochemical parameters: Turbidity, alkalinity, pH, hardness, chlorides, sulphates, ammonical nitrogen, nitrates, sulphate, oil and grease, available chlorine, dissolve oxygen, biochemical oxygen demand, chemical oxygen demand. Residual chlorine and chlorine demand, determination of available chlorine in Bleaching powder, Determination of Calcium, Potassium and Sodium. Determination of heavy metals in aqueous solution – Chromium, Lead and Zinc. Coagulation and flocculation of water – optimization of dose / pH / time of flocculation. Characteristics of Industrial wastewater. Analysis of solid wastes: characterisation of wastes from different industries.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **[PO.6]. The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in

societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. [Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	QUIZES (4)	20
	VIVA (4)	20
	Experiment reports submission	20
End Term Exam (Summative)	End Term Practical Exam and viva	30 +10
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup practical assignment on the experiment conducted on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked **blank**, so	

	that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/ Activity Assignment (Formative)	A student have to work in home, especially after conducting the experiment. These works has to be submitted immediately in the next class and evaluation will be done for the same. A student is expected to participate and perform these practical assignments with full zeal since the activity participation by a student will be assessed and marks will be awarded.

D. TEXT BOOKS

1. Standard Methods for the Examination of Water and Waste Water - ALPHA - AWWA – WPCF.
2. Sawyer C. McCarty P. and, Parkin G., Chemistry for Environmental Engineering, McGraw Hill, New York. 1994.
3. IS - 3025 - 1964 - Methods of Sampling and Test (Physical and Chemical) for Water Used in Industry, IIT New Delhi.
4. Drinking water Standards IS - 10500-1991.

E. Lesson Plan

Topics	Practical	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
Determination of pH of given sample	1	Applying knowledge to classify and analysing various water quality parameters. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making	Practical Demonstration	CV1532.1 CV1532.4	VIVA Quiz

		himself employable and involvement in independent and lifelong learning			
Determination of alkalinity of water of given water sample	1	Applying knowledge to classify and analysing various water quality parameters. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration		VIVA Quiz
Determination of acidity of water of given water sample	1	Applying knowledge to classify and analysing various water quality parameters. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.1 CV1532.4	VIVA Quiz

Determination of turbidity of given water sample	1	Applying knowledge to classify and analysing various water quality parameters. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.1 CV1532.4	VIVA Quiz
Determination of optimum dosage of coagulating required for the coagulation of suspended solids in the given water sample (jar test)	1	Analysing various physio-chemical and biological parameters of water and wastewater. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.2 CV1532.1	VIVA Quiz
Determination of solids in given water sample	1	Analysing various physio-chemical and biological parameters of water and wastewater.	Practical Demonstration	CV1532.2 CV1532.4	VIVA Quiz

		Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning			
Determination of hardness in given water sample	1	Analysing various physio-chemical and biological parameters of water and wastewater. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.2 CV1532.4	VIVA Quiz
Determination of dissolved oxygen in given water sample	1	Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz

		independent and lifelong learning			
Determination of chlorides in given water sample	1	Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz
Determination of chlorine demand and chlorine residue	1	Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz
Determination of B.O.D of given sample	1	Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz

Determination of C.O.D of given sample	1	Understanding the importance of advance waste treatment technologies with functional design of low-cost treatment systems used in rural areas for the sake of waste management. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz
Preparation of culture media, nutrient agar and MaConkey's broth	**1**	Understanding the importance of advance waste treatment technologies with functional design of low-cost treatment systems used in rural areas for the sake of waste management. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz

		employable and involvement in independent and lifelong learning			
Estimation of bacterial number	1	Understanding the importance of advance waste treatment technologies with functional design of low-cost treatment systems used in rural areas for the sake of waste management. Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning	Practical Demonstration	CV1532.3 CV1532.4	VIVA Quiz
Total Semester (hrs)	**14**				

J. COURSE OUTCOME ATTAINMENT LEVEL MATRIX:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES															
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSo 4
CV 1532. 1	Applying knowledge to classify and analysing various water quality parameters	2	2	3	2	2				3			3		3		3
CV 1532. 2	Analysing various physio-chemical and biological parameters of water and wastewater.	2	2	3	2	2				3			3		3	3	1
CV 1532. 3	Understanding the importance of advance waste treatment technologies with functional design of low-cost treatment systems used in rural areas for the sake of waste management.	2	2	3	2	2				3			3	1	3	3	1
CV 1532. 4	Apply knowledge of quality requirement and analysing techniques in the field of water and wastewater, according to the specific needs of public/ institute/ industry, making himself employable and involvement in independent and lifelong learning.	2	2	3	2	2				3			3	1			1

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Concrete Technology | CV1560 | 3 Credits | 3 0 0 3

Session: Jul 2018 – Dec 2018 | Faculty: Dr. Priyansha Mehra | Class: Dep. Elective (V Sem)

A. Introduction: This course is offered by Dept. of Civil Engineering as a Department Elective, targeting all civil students to give them a basic idea about Concrete. This course is deigned to impart basic knowledge on concrete technology including the composition of concrete, strength gain parameters in it, durability of concrete, etc. At the same time this course is designed to prepare students for concrete mix design, handle, and alter concrete which will develop their skill in concrete technology and make them employable.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1560.1]. Understand the composition of concrete and apply their engineering knowledge in analysing and formulating solutions for the specific problems in concrete

[CV1560.2]. Develop skill for designing environment friendly and sustainable concrete mixes as per codal provisions, maintaining ethical practices for concrete production

[CV1560.3]. Conduct investigations on the strength and durability parameter of concrete by using advanced and modern tools and equipment such as UTM, RCPT and Carbonation chamber

[CV1560.4]. Apply his knowledge of concrete technology in various structures, according to the specific needs of public/government/project, making himself employable and involvement in independent and lifelong learning.

`

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for discharging social responsibility as a civil engineer by innovative approaches at global platform

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Chemistry of cement: Composition of cement, hydration of Bogue's compounds, structure of hydrated cement, C-S-H gel, heat of hydration, gel- space ratio and its significance. **Concrete:** Definition, Grade, water cement ratio and it's role, Properties of fresh concrete, workability, air content, Flow ability, Segregation, Bleeding and Viscosity etc. Factors affecting workability. Influence of aggregate properties on workability of fresh concrete, methods of workability determination. Concrete Admixtures: Chemical and mineral admixtures, their types and uses, water reducers, accelerator, retarders, water-proofing plasticizers, super plasticizers, air-entraining agents. **Hardened Concrete:** Properties of hardened concrete, strength, permeability, creep, shrinkage, and factors influencing properties of concrete in hardened state. **Concrete mix deign:** Concrete Mix Design as per Indian Standards **Concrete Production:** Batching, mixing, placing, transportation, compaction, and finishing of concrete; equipment used in production, methods of concrete curing. **Durability of Concrete:** Definition, parameters effecting durability. Deteriorating mechanisms, alkali aggregate reaction, freeze and thaw,

carbonation, chloride attack, sulphate attack, corrosion of steel reinforcement. **Modern Concrete Technology:** Ready Mix Concrete, Pumpable concrete, High Strength and High-performance Concrete, Self-Compacting Concrete, waste utilization in concrete.

F. TEXT BOOKS

1. Concrete Technology, M.S.Shetty, S.Chand publishing, (8e), 2019
2. Concrete Technology, A.R. Santhakumar, Oxford University Press, 2006.
3. Properties of concrete, A.M. Neville, Pearson Education India; (5e) 2012

G. REFERENCE BOOKS

1. Concrete: Microstructure, Properties & Materials, P.K. Mehta, Tata Mc Graw Hill.
2. IS 10262 (2009), Bureau of Indian Standards, New Delhi.
3. Durability of Concrete Structures: Investigation, Repair, Protection, Geoffrey Mays, E & FN Spon, London, 1992.

Lecture Plan:

LECTURE PLAN – CV 1560 CONCRETE TECHNOLOGY

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Composition of cement	Understanding of cement composition	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
2	Hydration of Bogue's compounds	Knowledge of hydrated cement products	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
3	Structure of hydrated cement, C-S-H gel	Information on structure of hydrated cement products	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
4	Heat of hydration	Effects of heat of hydration	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
5	Gel-space ratio and its significance	Characteristics of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
6	Definition, Grade	Characteristics of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
7	Water cement ratio and it's role	Significant properties of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
8	Properties of fresh concrete, workability	Significant properties of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
9	Air content, Flow ability	Significant properties of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
10	Segregation, Bleeding and Viscosity etc.	Significant properties of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
11	Factors affecting workability	Factors affecting properties of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
12	Influence of aggregate properties on workability of fresh concrete	Aggregate impact on fresh properties of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
13	Methods of workability determination	Workability of concrete	Lecture	CV1560.1	Quiz, Assignments, Periodic exams
14	Concrete Mix Design as per Indian Standards	Concrete Mix Design as per Indian Standards	Lecture	CV1560.2	Quiz, Assignments, Periodic exams

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
15	Concrete Mix Design as per Indian Standards	Concrete Mix Design as per Indian Standards	Lecture	CV1560.2	Quiz, Assignments, Periodic exams
16	Chemical and mineral admixtures, their types and uses	Significance of concrete admixtures	Lecture	CV1560.2	Quiz, Assignments, Periodic exams
17	Water reducers, accelerator	Significance of concrete admixtures	Lecture	CV1560.2	Quiz, Assignments, Periodic exams
18	Retarders, water-proofing plasticizers	Significance of concrete admixtures	Lecture	CV1560.2	Quiz, Assignments, Periodic exams
19	Super plasticizers, air-entraining agents	Significance of concrete admixtures	Lecture	CV1560.2	Quiz, Assignments, Periodic exams
20	Properties of hardened concrete, strength	Behaviour of hardened concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
21	Permeability, creep, shrinkage	Long term loading behaviour of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
22	Factors influencing properties of concrete in hardened state	Behaviour of hardened concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
23	Batching, mixing, placing	Manufacture of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
24	Transportation, compaction, and finishing of concrete	Manufacture of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
25	Equipment used in production	Manufacture of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
26	Methods of concrete curing	Manufacture of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
27	Definition, parameters effecting durability.	Durability of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
28	Deteriorating mechanisms, alkali aggregate reaction	Durability of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
29	Freeze and thaw, carbonation	Durability of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
30	Chloride attack	Durability of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
31	Sulphate attack	Durability of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
32	Corrosion of steel reinforcement	Durability of concrete	Lecture	CV1560.3	Quiz, Assignments, Periodic exams
33	Ready Mix Concrete, Pumpable concrete	Various types of concrete to suit a particular situation	Lecture	CV1560.4	Quiz, Assignments, Periodic exams
34	High Strength and High-performance Concrete	Various types of concrete to suit a particular situation	Lecture	CV1560.4	Quiz, Assignments, Periodic exams
35	Self-Compacting Concrete	Various types of concrete to suit a particular situation	Lecture	CV1560.4	Quiz, Assignments, Periodic exams
36	Waste utilization in concrete	Advance research on concrete utilizing waste products	Lecture	CV1560.4	Quiz, Assignments, Periodic exams

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1560.1	Understand the composition of concrete and apply their engineering knowledge in analysing and formulating solutions for the specific problems in concrete	3	1	1	1		1	1					1	2			
CV1560.2	Develop skill for designing environment friendly and sustainable concrete mixes as per codal provisions, maintaining ethical practices for concrete production	2	1	1	1		1	2	1				1		2	1	
CV1560.3	Conduct investigations on the strength and durability parameter of concrete by using advanced and modern tools and equipment such as UTM, RCPT and Carbonation chamber	2	2	1	3	3	1			1					2	1	
CV1560.4	Apply his knowledge of concrete technology in various structures, according to the specific needs of public/government/project, making himself employable and involvement in independent and lifelong learning.	3	2	2	1	1	1		1	1	1		1			3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Course Instructor: Dr. Gaurav Sancheti

Course Coordinator: Dr. Gaurav Sancheti

Head, Civil Engineering Department

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Structural Analysis-II | CV 1564 | 3 Credits | 3 0 0 3

Session: Aug 18 – Dec 18 | Faculty: Firoz Alam| Class: B.Tech Civil V SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a department elective, targeting students who wish to pursue research & development in industries or higher studies in field of Structural Engineering. Offers in depth knowledge. This course offers in depth knowledge about the analysis process and techniques of indeterminate structures. Analysis for Shear Force, Bending Moment, Deflection, Rotation, moment distribution in beams and frames with sway and non-sway and also with sinking of supports will be executed in this course. Students are expected to have background knowledge on the analysis process of determinate structures for a better learning.

B. Course Outcomes: At the end of the course, students will be able to

[CV1564.1]. Understanding the concept of indeterminate structures for better employability
[CV1564.2]. Applying the concept to degree of indeterminacy of structural systems
[CV1564.3]. Analysing the displacement methods related to indeterminate structure
[CV1564.4]. Determining response of structure using force method of analysis
[CV1564.5]. Creating live problems to analyse a structure by inducing entrepreneurship skills to face problems

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering

community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	Class test and assignments	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Deflection of beams. Macaulay's method, area moment method and conjugate beam method. **Analysis of indeterminate structures**: Introduction to indeterminate structures, degrees of freedom per node, static and kinematic indeterminacy, releases in structures. **Analysis of beams and frames** by slope deflection method, analysis of fixed and continuous beams by theorem of three moments, effect of sinking and rotation of supports. **Analysis of structures** using moment distribution methods applied to continuous beams and portal frames with and without sway. **Unit load method**. Strain energy for gradually applied, suddenly applied and impact loads, Strain energy due to axial loads, bending, shear and torsion; **Castiglione's theorems**; stresses due to temperature and lack of fit in redundant frames; deflection of determinate beams, and frames using energy methods.

F. Text Books

1. B.C. Punmia, "*Strength of Materials and Mechanics of Structures: Vol. I*", Laxmi Publications (P) Ltd., 2014
2. Junarkar and Shah, "*Mechanics of Structures Vol.-I*", Charotar Publishing House, 2013
3. R. S. Khurmi and N. Khurmi, "*Theory of Structures*", S.Chand, 2018.

G. Reference Books

1. Timoshenko and Young , "*Mechanics of Structures*", Mc.Graw Hill Book Co., 2015
2. R.C Hibbler , "*Structural Analysis*", Pearsons Education, 2014

H. Lecture Plan:

Lecture Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction to Structural Analysis-II	To acquaint and clear teachers' expectations and understand student expectations	Lecture	CV1564.1	NA
2-4	Deflection of beams using conjugate beam method	Recall of conjugate mean method	Lecture	CV1564.1	Class Quiz / Test
5	Deflection of beams using Macaulay's method and area moment method	Recall of Macauly's and moment area method	Lecture	CV1564.4	Class Quiz / Test
6	Introduction to indeterminate structures and calculation of degrees of freedom per node	Understanding of indeterminate structures	Lecture	CV1564.4	Class Quiz / Test
7-8	Calculation of static and kinematic indeterminacy	Understanding and calculation of indeterminacies	Lecture	CV1564.3	Class Quiz / Test
9	Theory and process to find releases in structures	Understanding of indeterminate structures	Lecture	CV1564.2	Class Quiz / Test
10-12	Analysis of beams and frames by slope deflection method	Understanding of Slope Deflection method	Lecture	CV1564.2	Class Quiz / Test
13-14	Analysis of fixed and continuous beams by theorem of three moments	Understanding of Three moments theorem	Lecture	CV1564.2	Class Quiz / Test
15-16	Effect of sinking and rotation of supports related to Slope-deflection and Three moment theorem	Understanding the effect of sinking of supports and its analysis by slope deflection and three moments theorem	Lecture	CV1564.4	Class Quiz / Test
17-21	Analysis of structures using moment distribution methods applied to continuous beams and portal frames with and without sway	Understanding the process and effect of sway of frames	Lecture	CV1564.4	Class Quiz / Test
22	Unit load method	Understanding and learning of unit load method	Lecture	CV1564.4	Class Quiz / Test
23-24	Strain energy for gradually applied, suddenly applied and impact loads	Understanding the effect of different application of loadings and effects on strain energy	Lecture	CV1564.4	Class Quiz / Test
25-27	Strain energy due to axial loads, bending, shear and torsion	Understanding the strain energy concept due to axial load, bending effect, shear force and torsion resistance	Lecture	CV1564.4	Class Quiz / Test
28-30	Castiglione's theorems	Understanding and applications of Castigliano's method.	Lecture	CV1564.4, CV1564.5	Class Quiz / Test
31-33	Stresses due to temperature and lack of fit in redundant frames	Calculation of stress due to temperature and lack of fit in redundant structures	Lecture	CV1564.4	Class Quiz / Test
34-36	Calculation of deflection for determinate beams and frames using Energy Methods	Understanding the concept of energy methods and its application	Lecture	CV1564.4, CV1564.5	Class Quiz / Test

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV 1564.1	Understanding the concept of indeterminate structures for better employability	3		1			2				2		3				1
CV 1564.2	Applying the concept to degree of indeterminacy of structural systems	3	3	2	2		3				2		3		3		2
CV 1564.3	Analysing the displacement methods related to indeterminate structure	3	3	2	2		3				2		3	2	3	3	2
CV 1564.4	Determining response of structure using force method of analysis	3	3	2	2		3				2		3	2	3	3	2
CV 1564.5	Creating live problems to analyse a structure by inducing entrepreneurship skills to face problems	3	3	3	3		3			3	2		3	3	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Signature

Course Instructor **Head of Department**

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Geotechnical Engineering-II | CV1601| 4 Credits | 3 1 0 4

Session: January 19 – May 19 | Faculty: Dr. Arvind Kumar Jha | Class: Departmental Core Course

A. INTRODUCTION: This course is offered by Dept. of Civil Engineering as a departmental core course. The main objectives of this course are to understand, determine and analyses the engineering properties of soils and their application on the foundation design of structures. The course covers stress distribution in soils, consolidation of soils, earth pressure, and stability of slopes, shallow foundations, deep foundations, and site investigations. Overall, this course will help to solve the complex geotechnical engineering problems, design the foundation on different ground conditions and to handle the various civil engineering projects.

B. COURSE OUTCOMES:

After successful study of course, students will be able to:

[CV1601.1]. Analyse the problem related to foundation engineering.

[CV1601.2]. Determine and analyse the compressibility characteristics of soil.

[CV1601.3]. Determine earth pressure, stability of retaining walls and slopes for structural design.

[CV1601.4]. Determine bearing capacity of soils for application in the foundations design.

[CV1601.5]. Conduct site investigations and interpret results for engineering applications.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these

to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments, Projects/Activity feedbacks (Accumulated and Averaged)	30*
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment/quiz/viva on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No	

	extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/Quizzes/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although the garding of these works will be decided by course instructor. However, a student is expected to participate and perform these assignments with full zeal. Since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

**** The detail criteria for internal assessment is given at section J.***

E. SYLLABUS:

Stress distribution in soils: Elastic theories of stress distributions in soils: Boussinesq equation, pressure distribution diagram. Vertical pressure under uniformly loaded circular and rectangular area, equivalent point load method. Newmark's influence chart. Westergaard analysis, and Contact pressure. Numerical Exercises. ***Consolidation of soils***: Introduction, comparison between compaction and consolidation, Component of settlement- immediate, primary and secondary settlement. Terzaghi's one dimension consolidation theory, normally, under and over consolidated soils, laboratory one-dimensional consolidation test, time factor. Compressibility characteristics: determination of void ratio, coefficient of volume change, coefficient of consolidation and settlement. Estimation of pre-consolidation pressure, factors influencing compressibility behaviour of soils. Numerical Exercises. ***Earth pressure:*** Active, passive and earth pressure at rest. Rankine's and Coulomb's theories of earth pressure. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesionless back fill. Earth pressure on cantilever sheet piles, Stability analysis of retaining walls. Numerical Exercises. ***Stability of slopes***: Classifications of slopes, Stability analysis of infinite slopes, Stability analysis of finite slopes by Swedish and Friction circle method, Stability analysis by Taylor's stability number, Taylor stability number curves, Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction, Bishop's method of stability analysis. Numerical Exercises. ***Shallow foundation***: Introduction, bearing capacity, types of foundations.

Rankine's method for minimum depth of foundation. Terzaghi and Meyehoff's theory for bearing capacity. Skempton's method. Effect of eccentricity and water table on bearing capacity. Introduction to machine foundations. Numerical Exercises. ***Deep foundation:*** Types of piles, pile driving, Load carrying capacity of piles, Static and dynamic formulae Pile load test, Group behaviour of piles and negative skin friction, Introduction to well foundation, Numerical Exercises. ***Site Investigations***: Methods of explorations. Planning of Investigations, Depth of exploration, and number of boreholes. Undisturbed and Disturbed samples. Types of samplers. Brief description of procedures of sampling, Transportation and Storage of samples. Plate load and penetration tests for determining bearing capacity. Geophysical methods of investigations. Numerical Exercises.

F. TEXT BOOKS:

T1. Murthy, V. N. S., "Soil Mechanics and Foundation Engineering: A Book for Students and Practising Engineers", Dhanpat Rai (1977).

T2. K. R, Arora, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi (2005).

T3. Bowles J. E., "Foundation Analysis and Design." McGraw Hill, New York (1997).

G. REFERENCE BOOKS:

R1. Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications, 6th edition (2005).

R2. Ranjan G. and Rao A.S.R., "Soil Mechanics and Foundation Engineering", New Age International Publisher, New Delhi (2006).

R3. S. K. Garg, "Soil Mechanics and Foundation Engineering", Khanna Publishers, Delhi (2005).

R4. Terzaghi K., Peck R. B. and Gholamreza Messi, "Soil Mechanics in Engineering Practice", Wiley India (P) Ltd., New Delhi, 3rd Edition (2013).

R5. B. M. Das, "Advanced Soil Mechanics", Taylor and Francis, Washington (1997).

R6. Alam Singh, "Soil Engineering in Theory and practice", CBS Publishers and Distributors, Delhi (2006).

LECTURE PLAN:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Elastic theories of stress distributions in soils: Boussinesq Equation, pressure distribution diagram.	Stress distribution in soils	Lecture	CV1601.1	Quiz; Home Assignment ; Class Test;
2	Vertical pressure under uniformly loaded circular and rectangular area, equivalent point load method.	Stress distribution in soils	Lecture	CV1601.1	Quiz; Home Assignment ; Class Test;
3,4	Newmark's influence chart. Westergaard Analysis, and Contact Pressure.	Stress distribution in soils	Lecture	CV1601.1	Quiz; Home Assignment ; Class Test;
5,6	Numerical Exercises	Stress distribution in soils	Lecture	CV1601.1	Quiz; Home Assignment ; Class Test;
7	Introduction, comparison between compaction and consolidation, Component of settlement-immediate, primary and secondary settlement.	Consolidation of soils	Lecture	CV1601.2	Quiz; Home Assignment ; Class Test;
8,9	Terzaghi's one dimension consolidation theory, normally, under and over consolidated soils, laboratory one-dimensional consolidation test, time factor.	Consolidation of soils	Lecture	CV1601.2	Quiz; Home Assignment ;

					Class Test;
10	Compressibility characteristics: determination of void ratio, coefficient of volume change, coefficient of consolidation and settlement.	Consolidation of soils	Lecture	CV1601.2	Quiz; Home Assignment ; Class Test;
11	Estimation of pre-consolidation pressure, factors influencing compressibility behaviours of soils.	Consolidation of soils	Lecture	CV1601.2	Quiz; Home Assignment ; Class Test;
12,13	Numerical Exercises	Consolidation of soils	Lecture	CV1601.2	Quiz; Home Assignment ; Class Test;
14	Active, passive and earth pressure at rest.	Earth pressure	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
15,16	Rankine's and Coulomb's theories of earth pressure.	Earth pressure	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
17,18	Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesionless back fill.	Earth pressure	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;

19	Earth pressure on cantilever sheet piles, Stability analysis of retaining walls.	Earth pressure	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
20,21	Numerical practice and exercises	Earth pressure	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
22	Classifications of slopes, Stability analysis of infinite slopes.	Stability of slopes	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
23,24	Stability analysis of finite slopes by Swedish and Friction circle method.	Stability of slopes	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
25	Stability analysis by Taylor's stability number, Taylor stability number curves.	Stability of slopes	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
26	Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction.	Stability of slopes	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
27	Bishop's method of stability analysis.	Stability of slopes	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;

28,29	Numerical Exercises	Stability of slopes	Lecture	CV1601.3	Quiz; Home Assignment ; Class Test;
30	Introduction, bearing capacity, types of foundations. Rankine's method for minimum depth of foundation.	Shallow foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
31	Terzaghi and Meyehoff's theory for bearing capacity. Skempton's method	Shallow foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
32	Effect of eccentricity and water table on bearing capacity	Shallow foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
33	Introduction to machine foundations	Shallow foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
34,35	Numerical Exercises	Shallow foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
36	Types of piles, pile driving	Deep foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;

37	Load carrying capacity of piles, Static and dynamic formulae	Deep foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
38	Pile load test	Deep foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
39	Group behaviour of piles and negative skin friction	Deep foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
40	Introduction to well foundation	Deep foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
41,42	Numerical Exercises	Deep foundation	Lecture	CV1601.4	Quiz; Home Assignment ; Class Test;
43	Methods of explorations.	Site Investigations	Lecture	CV1601.5	Quiz; Home Assignment ; Class Test;
44	Planning of Investigations, Depth of exploration, and number of boreholes.	Site Investigations	Lecture	CV1601.5	Quiz; Home Assignment ; Class Test;

45	Undisturbed and Disturbed samples. Types of samplers. Brief description of procedures of sampling, Transportation and Storage of samples.	Site Investigations	Lecture	CV1601.5	Quiz; Home Assignment ; Class Test;
46	Plate load and penetration tests for determining bearing capacity.	Site Investigations	Lecture	CV1601.5	Quiz; Home Assignment ; Class Test;
47	Geophysical methods of investigations.	Site Investigations	Lecture	CV1601.5	Quiz; Home Assignment ; Class Test;
48	Numerical Exercises	Site Investigations	Lecture	CV1601.5	Quiz; Home Assignment ; Class Test;

H. COURSE ARTICULATION MATRIX: (MAPPING OF COS WITH POS)

COs	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1601.1	Analyse the problem related to foundation engineering.	3	1												2		
CV1601.2	Determine and analyse the compressibility characteristics of soil.	2	3	1										1	2		
CV1601.3	Determine earth pressure, stability of retaining walls and slopes for structural design	2	2	3										2	1		
CV1601.4	Determine bearing capacity of soils for application in foundations design.	2	2	3										2	3		
CV1601.5	Conduct site investigations and interpret results for engineering applications.	1			3	1				1	1		2		3		1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Transportation Engineering-II | CV1603| 4 Credits | 3 1 0 4

Session: January 19 – May 19 | Faculty: Sanchit Anand | Class: Core Course

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course, targeting B. Tech students to have a basic understanding in the field of Transportation Engineering, including Railway and Airport Engineering. Offers in depth knowledge of Railway and Airport Systems by covering alignment, geometric design, types of tracks, significance of coning, gauges, wind rose diagram, aircraft characteristics, airport planning and design, airport pavement design, and much more. This is a preliminary/introductory course on railways and Airport engineering which will help the students to make their path in the said course work in terms of higher technical education.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1603.1]. Understand the characteristics of Railway and Airport Systems

[CV1603.2]. Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems

[CV1603.3]. Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics

[CV1603.4]. Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Railway engineering: Introduction, Scope, terminology, Survey, Tractive resistance, Permanent way, Components parts rail and rail fastenings, ballast, sleepers, Railway creep, Anti-creep devices, coning of wheel, wear of rail. Alignment Details; Points and crossing: Necessity of turnouts, Switches and track

junction, Design of turnouts; Railway Station and Yards: Types and classification, equipment in Station Yards, Signals- Classification, function, Control on movement of train by different methods. Interlocking: Types and function.

Airport engineering: Introduction, History and development, Aviation organizations and their functions, Aircraft characteristics and its influence on airport planning, Airport Planning, Site selection, Obstructions, Airport configuration; Geometric Design: Runway orientation, Basic runway lengths, Geometric design of Runway and Exit taxiways; Airport Capacity: Runway and Terminal capacity and its improvement, Delay related capacity, Gate position and gate capacity, Terminal area, Aircraft parking system. Visual aids and Air traffic control system: - Flight rules, Navigational and landing aids, VASI, PAPI enroute air traffic control, ILS, MLS; Pavement Design: ESWL concepts, FAA method and LCN-PCN method of pavement design; Airport Drainage System:-Design runoff, Surface and subsurface drainage.

F. TEXT BOOKS

1. *Saxena S.C. and Arora S.P, A Text Book of Railway Engineering.*
2. *Rangwala S.C., Airport Engineering, Charotar Publication, 2013*

G. REFERENCE BOOKS

1. *Rangwala S.C., Airport Engineering, Charotar Publication, 2013*
2. *Horenjeff R. and McKelvey F. Planning and Design of Airports, Fourth edition, McGraw Hill Company, New York, 1994.*
3. *Ashford N. and Wright P.H., Airport Engineering, Third edition, John Wiley and Sons, New York, 1992.*

4. **Lecture Plan:**

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1,2	Introduction	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	NA
3	Types and Selection of Gauges,	Understand about different types of gauges in Indian railway network	Lecture	CV1603.1	In Class Quiz
4,5	Selection of Alignment,	Identify the different routes between origin and destination	Lecture and field visit	CV1603.1	In Class Quiz End Term
3	Ideal Permanent Ways and Cross-sections in different conditions,	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	1st Sessional ET Exam Home Assignment
4	Drainage, Salient Features	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
5	Types of Components viz. Rails,	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
6	Types of Components viz. Sleepers,	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	1st Sessional ET Exam Home Assignment
7	Types of Components viz. Ballast,	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
8	Types of Components viz. Fastenings.	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
9	Coning of Wheels, Creep, Wear,	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
10	Failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing Stations, Yards and Sidings, Turn-Table, Signalling.	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
11	Failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	

	Stations, Yards and Sidings, Turn-Table, Signalling.				1st Sessional ET Exam Home Assignment
12	Failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing Stations, Yards and Sidings, Turn-Table, Signalling.	Understand the characteristics of Railway and Airport Systems	Lecture	CV1603.1	
13	Types of Turnouts, Points or Switches,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	1st Sessional ET Exam Home Assignment
14	Types of Turnouts, Points or Switches,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
15	layout Plans of different types of Crossings,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
16	Design calculations of turnouts.	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
17	Surface railways (sub urban railway system of Mumbai, Chennai and Delhi),	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	1st Sessional ET Exam Home Assignment
18	Underground system (Metro of Kolkata/ Delhi),	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
19	Elevated Systems (as Proposed for Jaipur, Delhi, Mumbai),	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
20	Light Rail System (MRTS, Thane).	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	1st Sessional ET Exam Home Assignment

21	Recent developments in Railway Networking.	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
22	Gradient and Grade Compensation,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
23	Super elevation	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	1st Sessional ET Exam Home Assignment
24	Types of Curves,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
25	Transition curves, their designs,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
26	Transition curves, their designs,	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	2ndSessional ET Exam Home Assignment
27	Widening of Gauges.	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	Lecture	CV1603.2	
28	Introduction:	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	2nd Sessional ET Exam Home Assignment
29	Requirements to Airport Planning, Airport Classifications,	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	
30	Factors in Airport Site Selection,	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	

31	Airport Size, Obstructions, Zoning.	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	2nd Sessional ET Exam Home Assignment
32	Requirements of Airport, Planning of Terminal Area, and different Layouts	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	
33	Planning of Terminal Area, and different Layouts	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	2nd Sessional ET Exam Home Assignment
34	Location of Gates, Types of Runway patterns,	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	
35	Runway Layout, Runway Length,	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	
36	Geometric Design of Runways,	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	2nd Sessional ET Exam Home Assignment
37	Geometric Design of Runways	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	
38	Geometric Design of Runways	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.	Lecture	CV1603.3	
39	Layout of Taxiways, Geometric Standards,	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects	Lecture	CV1603.4	
40	Exit or Turn around Taxiways, Apron and Hangers	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects	Lecture	CV1603.4	
41	Factors Affecting Pavement Design,	Demonstrate the knowledge in terms of design reports and	Lecture	CV1603.4	

		presentations for Railway and Airport projects			2nd Sessional ET Exam Home Assignment
SECOND SESSIONAL EXAM					
42	Design methods of Flexible Pavements,	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects	Lecture	CV1603.4	
43	Design methods of Flexible Pavements,	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects	Lecture	CV1603.4	
44	Design methods of Rigid Pavements.	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects	Lecture	CV1603.4	
45	Design methods of Rigid Pavements.	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects	Lecture	CV1603.4	
46	Revision-1				
47	Revision-2				
END TERM EXAM					

5. **Course Articulation Matrix: (Mapping of COs with POs)**

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV 1603.1	Understand the characteristics of Railway and Airport Systems	1					1					1	2			1	1
CV 1603.2	Investigate and Identify the problems and give the solutions in terms of updated designs for Railway and Airport Systems	2	3	3	3		2		1					2	3		
CV 1603.3	Apply modern tools such as AutoCAD for geometric design and alignment of railway tracks in the optimized manner to benefit the environment, society and maintaining professional ethics.					3		2	1				1	1	2		
CV 1603.4	Demonstrate the knowledge in terms of design reports and presentations for Railway and Airport projects					1				1	2	1	2			2	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Design of Steel Structures | CV 1604 | 3 Credits | 3 1 0 4

Session: Jan 19 – May 19 | Faculty: Dr. Shaik Hussain | Class: B.Tech Civil (VI Sem)

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental lecture, targeting students who wish to pursue higher studies in the field of Structural Engineering. The course offers in depth knowledge of Structural fasteners: Bolted and welded connections, Design of Tension members, Design of compression member, Design of column base, Design of flexural member, Design of plate girder and Plastic analysis and application of these theory in beams with different support conditions, symmetrical and asymmetrical portal frame as per sign as per IS 800.

B. Course Outcomes: At the end of the course, students will be able to

[CV1604.1]. Understand the load transfer mechanism in steel structures

[CV1604.2]. Various connections in the steel structures and their applicability

[CV1604.3]. Design of various structural steel elements for flexure, compression and in truss members.

[CV1604.4]. The applicability of plastic analysis and how it varies from conventional design methods.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health

and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal,

health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in

societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the

engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Introduction: Scope and use of structural steel. Structural fasteners: Bolted and ☐welded connections. Design of Tension members: Design of axially loaded tension members for yielding, rupture and block shear - Sections with welded and bolted connections, lug angle. ☐ **Design of compression member** Design of axially loaded compression member -laced and battened columns, Design of column splices. Design of column base: Simple slab base, gusseted base and grillage foundation. **Design of flexural member**: Design of beams-laterally supported and laterally unsupported compression flange. Design of plate girder and gantry girder: Design of plate girder: proportioning of web, proportioning of flanges, stiffeners. Design of Gantry girder. **Plastic analysis:** Plastic theory, Shape factor, Upper bound and lower bound theory, application of ☐these theory in beams with different support conditions, symmetrical and asymmetrical portal frame.

F. Text Books

1. N. Subramanian, "Design of Steel Structures", Oxford University press, New Delhi, 2008.☐
2. S.K. Duggal, "Limit State Method of Design of Steel Structures", Tata McGraw-Hill, New Delhi, 2010. ☐

G. REFERENCE BOOKS ☐

1. IS 800-2007: General Construction in Steel-Code of Practice (Third Revision), Bureau of Indian Standards, New Delhi.☐
2. SP: (6)-1964: Hand Book for Structural Engineers, Bureau of Indian Standards, New Delhi. ☐

H. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	Scope and use of structural steel ☐	Recall the use of steel as a potential construction material	Lecture	1604.1	In Class Quiz (Not Accounted)
3,4	Structural fasteners: bolted connections ☐	Identify various types of bolted connections	Lecture	CV1604.2	In Class Quiz End Term
5,6	Structural fasteners: bolted connections ☐	Learn applicability of each of the connections	Tutorial	CV1604.2	Home Assignment End Term
7.8	Structural fasteners: bolted connections ☐	Undestand factors that govern the strength of the joint	Lecture	CV1604.2	In Class Quiz End Term
9	Structural fasteners: bolted connections ☐	Use of Eccentric connections	Tutorial	CV1604.2	Class Quiz Mid Term I End Term
10	Structural fasteners: bolted connections ☐	Use of Eccentric connections	Lecture	CV1604.2	Class Quiz Mid Term I End term
11	Structural fasteners: Welded connections ☐	Identify various types of Welded connections	Lecture	CV1604.2	Home Assignment Class Quiz Mid Term I End Term
12	Structural fasteners: Welded connections ☐	Learn applicability of each of the connections	Lecture	CV1604.2	Class Quiz Mid Term I End Term
13	Structural fasteners: Welded connections ☐	Undestand factors that govern the strength of the joint	Lecture	CV1604.2	Class Quiz Mid Term I End Term
14	Structural fasteners: Welded connections ☐	Use of Eccentric connections	Tutorial	CV1604.2	Class Quiz End Term
15,16	Design of axially loaded tension member ☐	Study the implications of tension members	Lecture	CV1604.3	Class Quiz Mid Term II End Term
17	Design of axially loaded tension member ☐	Understand the various load mechanism in a tension member	Lecture	CV1604.3	Class Quiz Mid Term II End Term
18	Design of axially loaded tension member ☐	Design a tension member for a given load	Lecture	CV1604.3	Class Quiz Mid Term II

					End Term
19	Design of axially loaded tension member ☐	Design a tension member for a given load	Tutorial	CV1604.3	Class Quiz Mid Term II End Term
20	Design of axially loaded tension member ☐	Design a tension member for a given load	Lecture	CV1604.3	Class Quiz End Term
21	Design of axially loaded tension member ☐	Design a tension member for a given load	Lecture	CV1604.3	Class Quiz End Term
22	Design of axially loaded tension member ☐	Design a tension member for a given load	Tutorial	CV1604.3	Class Quiz End Term
23	Design of axially loaded tension member ☐	Design a tension member for a given load	Lecture	CV1604.3	Class Quiz End Term
24	Design of axially loaded tension member ☐	Joining of various tension members	Lecture	CV1604.3	Class Quiz End Term
25	Design of axially loaded compression member ☐	Study the implications of tension members	Lecture	CV1604.3	Class Quiz End term
26	Design of axially loaded compression member	Understand the various load mechanism in a compression member	Lecture	CV1604.3	Class Quiz
27	Design of axially loaded compression member	Design a compression member for a given load	Tutorial	CV1604.3	Class Quiz Mid Term II End Term
28,29	Design of axially loaded compression member	Design a compression member for a given load	Lecture	CV1604.3	Class Quiz Mid Term II End Term
30,31	Design of axially loaded compression member	Design a compression member such as lacings for a given load	Lecture	CV1604.3	Class Quiz Mid Term II End Term
32,33	Design of axially loaded compression member	Design a compression member such as battens for a given load	Tutorial	CV1604.3	Class Quiz End Term
34,35	Design of flexural member	Understand the difference in the structural response of a RCC beam and steel beam in flexure	Lecture	CV1604.3	Class Quiz End Term
36, 37	Design of flexural member	Study the various boundary condition in the design of the flexural member	Lecture	CV1604.3	Class Quiz End Term
38	Design of flexural member	Design a steel beam for flexure	Tutorial	CV1604.3	Class Quiz End Term
39	Design of plate girder	Introduction to industrial steel structures	Lecture	CV1604.3	End Term
40	Design of plate girder	Understand the mechanism of rolling loads and influence line	Lecture	CV1604.3	End Term

		diagrms			
41	Design of plate girder	Design of steel girder	Lecture	CV1604.3	End Term
42	Design of plate girder	Design of steel girder	Lecture	CV1604.3	End Term
43	Design of plate girder	Design of steel girder	Tutorial	CV1604.3	End Term
44	Design of plate girder	Design of steel girder	Lecture	CV1604.3	End Term
45	Design of plate girder	Design of steel girder	Tutorial	CV1604.3	End Term
46	Plastic analysis	Understand the difference between plastic and elastic method of analysis	Lecture	CV1604.4	End Term
47	Plastic analysis	Understand the concept of plastic hinge	Lecture	CV1604.4	End Term
48	Plastic analysis	Study failure mechamism in a beam	Lecture	CV1604.4	End Term
49	Plastic analysis	Study failure mechamism in a portal frame	Tutorial	CV1604.4	End Term
50	Plastic analysis	Understand the applications of work energy theorem in steel design	Tutorial	CV1604.4	End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
CV1604.1	Understand the load transfer mechanism in steel structures	3							1					2		2	1
CV 1604.2	Various connections in the steel structures and their applicability		2	2								2			2		1
CV 1604.3	Design of various structural steel elements for flexure, compression and in truss members.				2	2											1
CV 1604.4	The applicability of plastic analysis and how it varies from conventional design methods.						2		2	3						3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Structural Drawing | CV1630| 1 Credits | 0 0 3 1

Session: Jan 19 - May 19 | Faculty: Sourav Kumar Das | Class: B.Tech Civil VI SEM

A. **Introduction:** This course is offered by Dept. of Civil Engineering as a Departmental Laboratory Course, targeting students who wish to pursue higher studies in the field of Structural Engineering. The first part of the course is to introduce the students to understand the commands of AutoCAD and use them in a sequential procedure and steps while drawing the reinforcement layout for RCC structure and Steel Structure. In the second part student will design a full RCC and Steel structure using Staad-Pro and will draw the layout of the designed structure using AutoCAD. This course will help the student to develop their skills in drawing different RCC and Steel structures along with their detailing in terms of reinforcement and layout.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CV1630.1]. **Replicate** the reinforcement layout details of a residential building into a drawing

[CV1630.2]. **Create** a detailed residential building/commercial building reinforcement layout.

[CV1630.3]. **Use** computer software like Staad-Pro and AutoCAD to design and draw the reinforcement layout along with the section, elevation view.

[CV1630.4]. **Learn** the procedures of submission of drawings and Develop working and submission Drawings for Different types of structures.

[CV1630.5]. **Prepare, read** and **interpret** the drawings in a professional set up.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal Assessment (Viva, Lab performance, Lab book maintenance, Punctuality in lab)	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Lab Experiments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup laboratory experiment will be performed on the topic taught on the day of absence and it will have to be performed within two weeks from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 3 throughout the entire semester.	

E. SYLLABUS

RCC design and detailing of one-way and two-way continuous slab, singly and doubly rectangular square isolated beam and T-beam, axial, biaxial and uniaxial column, Rectangular combined, isolated and raft footings, dog-legged type and open newel type staircase. Steel design and detailing of axial/uniaxial/biaxial loaded steel column with lacings, battening and splices, roof truss purlin and bearing plate, beam to beam and beam to column connection, Welded plate girder.

F. REFERENCE BOOKS

1. Krishnamoorthy, "*Structural Design and Drawing (Concrete Structures)",* CBS Publications, New Delhi 2008.
2. S.K. Duggal,"*Limit State Design of Steel Structures"*, Tata McGraw Hill Education Private Limited - New Delhi, 2008.

G. Lecture Plan:

Lecture Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-2	RCC Design	RCC design and detailing of one-way and two-way continuous slab	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
3-4		RCC design and detailing of singly and doubly rectangular square isolated beam and T-beam	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
5		RCC design and detailing of axial, biaxial and uniaxial column	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
6		RCC design and detailing of rectangular combined, isolated and raft footings	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
7		RCC design and detailing of dog-legged type and open newel type staircase	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.2, CV1630.3	Daily Class Assessment
8-9	Steel Design	Steel design and detailing of axial/uniaxial/biaxial loaded steel column with lacings, battening and splices	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
10		Steel design and detailing of roof truss purlin and bearing plate	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
11-12		Steel design and detailing of beam to beam and beam to column connection	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.3	Daily Class Assessment
13-14		Steel design and detailing of Welded plate girder	Practical	CV1630.1, CV1630.5, CV1630.4, CV1630.2, CV1630.3	Daily Class Assessment

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CV1630.1]	**Replicate** the reinforcement layout details of a residential building into a drawing	3				3	3			3			3	1			
[CV1630.2]	**Create** a detailed residential building/commercial building reinforcement layout.	2	1	3		3	2						3	3			
[CV1630.3]	**Use** computer software like Staad-Pro and AutoCAD to design and draw the reinforcement layout along with the section, elevation view.					3							3	3	3		
[CV1630.4]	**Learn** the procedures of submission of drawings and develop working and submission drawings for different types of structures.					3				3			3	1		2	2
[CV1630.5]	**Prepare, read** and **interpret** the drawings in a professional set up.	1			2	2	1				2	2	3	2	3	2	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Computer Aided Design | CV1631| 1Credits | 0 0 2 1

Session: Jan 19-May 19 | Faculty: Firoz Alam Faroque | Class: B.Tech VIth SEM

A. Introduction:

This course is offered by Dept. of Civil Engineering as a departmental Laboratory course for sixth semester students. The subject offers a basic understanding of different softwares such as STAAD Pro V8i, MS-Project, MX Road Suite V8i, Bentley Power Civil for Country, Bentley SewerGEMS V8i, WaterGEMS V8i available in civil engineering domain for designing and analysis of various civil engineering structures. Some of the key domains of civil engineering such as Structural engineering, Transportation engineering, Water resource engineering, Environmental engineering and Study of GIS and Remote Sensing softwares are highlighted in this laboratory course. Because of application of various software being used in industry this course makes our students more employable and professional.

B. Course Outcomes: At the end of this course, students will be able to:

[CV 1631.1] Comprehend about different software used in civil engineering**.**

[CV 1631.2] Design and analysis of buildings using STAAD software and exposure to employment in similar industry.

[CV 1631.3] Apply knowledge of engineering fundamentals to analyse the results from software.

[CV 1631.4] Use modern tools for proper represents the results of software and entrepreneurial opportunities

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	-
	Sessional Exam II (Close Book)	-
	Online quiz, class exam, viva, discipline, report writing	60
End Term Exam (Summative)	Live test, report writing, viva with external	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. If student missed any quizzes and class tests, he/she will be allowed to appear only one substitute quiz and class test.	

E. SYLLABUS

Analysis of plane truss, space truss, palne frames, space frames by STAAD Pro V8i. Analysis of a four noded plate element with one end fixed and point load at free end in StaadPro V8i. Design of trusses using STAAD V8i software. Design of frames using STAAD Pro V8i software. Study of GIS and Remote Sensing software. Modelling of an isolated footing in STAAD Foundation V8i. Modelling of a dome structure using structure wizard in StaadPro V8i. Demonstration of packages in Engineering Management - MS-Project, and Estimation. Demonstration of packages in Transportation Engineering - Bentley MX Road Suite V8i, Bentley Power Civil for Country. Demonstration of packages in Environmental Engineering - Bentley SewerGEMS V8i, WaterGEMS V8i. Analysis and design of a G+4 reinforced concrete building in StaadPro StaadPro V8i

F. TEXT BOOKS

1. **1. www.bently.com/ software manual**
2. Design of R.C.C. Buildings using Staad Pro V8i with Indian Examples: Static and Dynamic Methods By TS Sharma

G. REFERENCE BOOKS

1. Various Indian Standard Codes of civil engineering for designing.
2. Various Software manuals and related helping materials.

G. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Basic Introduction of STAAD Pro. And other software's.	To provide background information about the development of software's	Practical	CV1631.1; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
2	Analysis of plane truss, space truss, palne frames, space frames by STAAD Pro V8i	To know how to begin with designing of structure.	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
3	Modeling of a four noded plate element	To know how to model four nodded plate elements.	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
4	Analysis of a four noded plate element with one end fixed and point load at free end in StaadPro V8i.	To solve for various outcomes of a elements.	Practical	CV1631.3; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
5	Design of frames using STAAD Pro V8i software	To design a fame structure on STAAD.	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
6	Study of GIS and Remote Sensing softwares	To study of GIS and Remote Sensing softwares	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
7	Modelling of an isolated footing in STAAD Foundation V8i.	To study modelling of a isolated	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing

					Live test, report writing, viva with external
8	Modelling of a dome structure using structure wizard in StaadPro V8i	To study modelling of a dome	Practical	CV1631.4; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
9	Demonstration of packages in Engineering Management - MS-Project, and Estimation	To explain about the packages of engineering management	Practical	CV1631.3; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
10	Demonstration of packages in Transportation Engineering	To explain about the packages of transportation engineering	Practical	CV1631.3; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
11	Demonstration of packages in Environmental Engineering	To explain about the packages of environmental engineering	Practical	CV1631.3; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
12	Bentley SewerGEMS V8i, WaterGEMS V8i.	To study about the sewer GEMS	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
13	Analysis and design of a G+4 reinforced concrete building in StaadPro StaadPro V8i	To learn how to design a multi-storey building structure	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external
14	Analysis and design of a G+4 reinforced concrete building in StaadPro StaadPro V8i	To learn how to design a multi-storey building structure	Practical	CV1631.2; CV1631.4	Online quiz, class exam, viva, discipline, report writing Live test, report writing, viva with external

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

COs	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1631.1	**Comprehend** about different software used in civil engineering	2	2	2	1	1	1		1	1			2	1	3	2	1
CV1631.2	**Design** and analysis of buildings using STAAD software and exposure to employment in similar industry.	3	2	2	1	1	1		1	1			2	2	3	1	1
CV1631.3	**Apply knowledge** of engineering fundamentals to analyse the results from software.	3	2	2	1	1	1		1	1			2	3	3	1	1
CV1631.4	**Use modern tools** for proper represents the results of software and entrepreneurial opportunities	2	2	2	1	1	1		1	1			2	3	3	1	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Environmental Engineering II | CV1660| 1 Credits | 3 0 0 3

Session: January 19 – May 19 | Faculty: Prof. R. C. Gaur | Class: Environmental Engineering II

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental elective Course, targeting students who wish to work in the field of environmental engineering. The first part deals with quality and quantity of wastewater. In all it deals with collection conveyance treatment and disposal of wastewater. Conventional and advanced treatment methods are considered. The design of sewer lines is there. Disposal on land and in water are discussed. The second part deals with plumbing and house drainage.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1660.1] **Comprehend** about different characteristics of waste water.
[CV1660.2] Design the sewer lines and the sewerage systems.
[CV1660.3] Understand the various treatment systems of waste water.
[CV1660.4] Utilize the knowledge in Waste water disposal and reuse and design of house drainage.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Design economic, environment friendly, sustainable Civil engineering structures keeping in view national and social requirements.

[PSO.2] Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex Civil engineering problem.

[PSO.3] Manage/ execute Civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4] Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

CV1660 ENVIRONMENTAL ENGINEERING-II [3 0 0 3]

Overview and general terms. Characteristics of sewage, standards of disposal into natural waters and on land, Indian standards. Collection of sewage, components of sewerage systems, systems of layout, quantity of sanitary sewage and variations. Hydraulic design of sewers. Treatment of sewage: Various unit and their purpose, sequence and efficiencies, preliminary treatment, screening and grit removal units, oil and grease removal, primary treatment, secondary treatment, activated sludge process, trickling filter, sludge digestion and drying beds, stabilization pond, septic tank, soakage systems, recent trends in sewage treatment. Advanced wastewater treatment - nutrient removal, solids removal. Waste water disposal and reuse: Disposal of sewage by dilution, self- purification of streams, sewage disposal by irrigation sewage farming, waste water reuse. Plumbing for design of buildings: Various systems of plumbing, layout of house drainage.

References:

1. Sawyer and Mc Carty, "*Chemistry for Environmental Engineering*" International student Edition, McGraw Hill Book Company, New York., 1994.
2. IS Standards 2490 - 1974, 3360 – 1974, 3307 – 1974, Indian Standard Institution, Manak Bhavan, New Delhi.
3. "*Manual on sewage and sewage treatment CPHEO*", Ministry of Urban development, New Delhi.

4. Metcalf and Eddy, "*Waste Water Engg, Treatment and Reuse*", Tata McGraw Hill, New Delhi, 1974.
5. "*Standard Methods*", APHEA, American Public Health Association, 1015 Fifteenth Street, NW Washington DC.
6. S. K. Garg, "*Environmental Engg- II*", Volume – II, Khanna Publishers, New Delhi, 2015.
7. G.S. Birdie, "*Water Supply and Sanitary Engineering*", Dhanpat Rai and Sons, New Delhi, 2012

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1,2	Introduction	General Definitions	Lecture	CV1660.1	NA
3,4	Characteristics	Characteristics of sewage, BOD COD	Lecture	CV1660.1	I Sessional
5,6	Derivation	Derivation of BOD equation Significance of 5 day BOD	Lecture	CV1660.1	I Sessional
7,8	Numerical	Numerical on BOD	Lecture	CV1660.1	1st Sessional
9,10	Sewerage	Sewerage systems. Runoff calculation.	Lecture	CV1660.1	
11,12	Quantity	Quantity of sewage and variation peak factor	Lecture	CV1660.2	ET Exam Home Assignment
13,14	Hydraulic design	Hydraulic design of Sewers flowing partially full	Lecture	CV1660.2	1st Sessional
15	Flow diagram	Flow diagram of Sewage Treatment and efficiencies	Lecture	CV1660.2	ET Exam
16	Design of Screens	Design of Screens	Lecture	CV1660.3	Home Assignment
17,18	Design of Grit Chambers	Design of Grit Chambers and factors affecting quantity of Grit Collected	Lecture	CV1660.3	Skill Development
19,20		Activity=Site visit to STP	Visit	CV1660.3	
21,22	Growth Systems	Attached and Suspended Growth Systems	Lecture	CV1660.3	
23,24,25	ASP	Activated Sludge Process Design, Modifications	Lecture	CV1660.3	2nd Sessional
26,27	Filtration	Tickling filters, Standard and High rate.	Lecture	CV1660.3	ET Exam
28,29	Sludge Digestion	Sludge Digestion. Thickening and drying	Lecture	CV1660.3	Home Assignment
30,31	Stabilization pond	Stabilization pond. Design of Oxidation ponds	Lecture	CV1660.3	Skill Development
32,33,34	External Treatment Plant	Activity= Site Visit to external plant	VIsit	CV1660.3	
35,36	Septic Tanks	Septic Tanks. Anaerobic digestion	Lecture	CV1660.3	
37,38	Reuse	Waste Water Disposal and reuse	Lecture	CV1660.3	ET Exam
39	Self purification	Self purification of streams	Lecture	CV1660.3	
40,41,42	Advanced Treatment	Advanced wastewater treatments. Nutrient removal	Lecture	CV1660.3	Home Assignment
43,44,45	House Connections	Plumbing systems, layout of house drainage	Lecture	CV1660.4	ET Exam

1. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO 5
CV1660.1	**Comprehend** about different characteristics of waste water	3	2		2								2		2			
CV1660.2	Design the sewer lines and the sewerage systems.	2		3	3	2	1						3		3	1		
CV1660.3	Understand the various treatment systems of waste water.	2			2	2	3	3		1					3			
CV1660.4	**Utilize the knowledge in Waste water disposal and reuse and design of house drainage.**				2	3	1			3	2	3			2	2	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Hand-out

Geographical Information System | CV 1690 | 3 Credits | 3 0 0 3

Session: January – May 2019 | Faculty: Dr Harshavardhana B G | Class: Open Elective

Introduction: This course is offered by Department of Civil Engineering as an Open Elective Course, targeting students, wishing to understand the application of Remote Sensing and Geographical Information System techniques in the present world. This course introduces remote sensing (RS) and geographical information system (GIS) with their application in different fields of scientific research such as geology, ocean science, land use land cover studies, environmental science, etc. It is to impart knowledge about the processes involved in developing a useful data out of aerial photographs / satellite imageries. Capturing information regarding the changing world and its compilation in a useful manner, in terms of GIS, for future references is a need of present day. In this respect, this course would equip students with basic idea about the usefulness of RS and GIS.

A. Course Outcomes: At the end of the course, students will be able to;

[CV1690.1]. Understand the concept and basics of remote sensing (RS) and geographical information system (GIS) required for employment opportunities in the related field.

[CV1690.2]. Know about different satellites and sensors involved in the RS and GIS application.

[CV1690.3]. Discern the application of RS and GIS in spatial and temporal investigations of geological, climatic and environmental problems and hence, helping for an entrepreneurship.

B. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes only (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

Introduction and Concepts: Introduction of remote sensing: energy sources and radiation principles, energy equation, electromagnetic radiation (EMR) and spectrum, interaction of EMR with atmosphere and earth surface features, spectral response pattern and spectral reflectance of vegetation, soil and water bodies. Introduction to aerial photography.

Satellite Remote Sensing Principles: Data acquisition procedure, digital image processing, intensity reference data, ground-truth, analogue to digital conversion, detector mechanism: spectro-radiometer, platforms and sensors, orbit types and image resolution.

Remote Sensing Satellites: Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, high resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, weather/meteorological satellites, INSAT series, NOAA, GOES, NIMBUS applications, Marine observation satellites OCEANSAT.

Types of Remote Sensing and Image Interpretation: Introduction to active and passive remote sensing, optical remote sensing, visible, infrared, thermal sensors, concept of microwave remote sensing and sensors, SLAR, SAR scatterometer, image interpretation characters.

Geographical Information Systems (GIS): Database, raster and vector data, database management system, digital elevation models and their applications, strategies involved in GIS (data capture, data retrieval, spatial measurement, data integration, spatial interpolation, data analysis)**;** application of GIS in various fields such as land use and land cover, water and land resources, environment and traffic system etc.

E. TEXT BOOKS

1. Cambell J.B., "Introduction to Remote Sensing", Taylor & Francis, UK, 22.
2. Sabins Jr F.F., "Remote Sensing - Principles and Interpretation", W.H. Freeman and Co., New York, 1986.
3. Burrough P. A. and McDonnell, R. A., "Principles of Geographical Information Systems", 2nd Edition, Oxford University Press, 1998.
4. Demers M. N., "Fundamentals of Geographic Information Systems", John Wiley and Sons, 3rd Edition, 22.

F. REFERENCE BOOKS

1. Weng, F., "Passive Microwave Remote Sensing of the Earth: for Meteorological Applications", John Wiley and Sons, 384 P, 217.

2. Janssen, L. L. F. and Huurneman, G. C. (Eds.), "Principles of Remote Sensing", ITC Educational Text Book Series, 41 P, 2nd Edition, 21.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction to Remote Sensing, energy sources and radiation principles, energy equation.	Understanding the basics of Remote Sensing	Lecture	CV1690.1	Quiz, MTE-I and ETE
2	Electromagnetic radiation (EMR) and spectrum.				
3	Interaction of EMR with atmosphere and earth surface features.				
4	Spectral response pattern and spectral reflectance of vegetation, soil and water bodies.				
5, 6, 7	Introduction to aerial photography	Knowing the basics of Aerial Photography			
8	Satellite Remote Sensing Principles	Understand the process and terminologies involved in satellite remote sensing	Lecture	CV1690.1	Quiz, MTE-I and ETE
9	Data acquisition procedure, digital image processing.				
1	Digital image processing, intensity reference data.				
11	Ground-truth, analogue to digital conversion.				
12	Detector mechanism: spectro-radiometer, platforms and sensors and orbit types.				
13	Image resolution.				
14	Remote Sensing Satellites: Land observation satellites, characters and applications.	Knowing the types of satellites in use		CV1690.2	Quiz, MTE-II and ETE
15	IRS series, LANDSAT series and SPOT series,		Lecture		
16	High resolution satellites, character and applications,				
17	CARTOSAT series, IKONOS Series and QUICKBIRD series.				
18	Weather/meteorological satellites, INSAT series.				
19	NOAA, GOES, NIMBUS applications and Marine observation satellites OCEANSAT.				
20	Types of Remote Sensing and Image Interpretation.	Understand the remotely sensed data and its interpretation	Lecture	CV1690.2	Quiz, MTE-II and ETE

21	Introduction to active and passive remote sensing.	Knowing the basics of remote sensing carried out at different frequencies	Lecture	CV1690.2	Quiz, MTE-II and ETE
22	Optical remote sensing and visible sensors.				
23	Infrared and thermal sensors.				
24	Concept of microwave remote sensing and sensors.				
25	SLAR, SAR Scatterometer.				
26	Image interpretation characters.	Understanding the basics of image interpretation and GIS platform	Lecture	CV1690.2	Quiz and ETE
27	Introduction to Geographical Information Systems (GIS).		Lecture	CV1690.3	
28	Database, raster and vector data.				
29	Database management system, digital elevation models.				
3	Digital elevation models and their applications.				
31, 32, 33	Strategies involved in GIS; data capture, data retrieval, spatial measurement, data integration, spatial interpolation, data analysis).				
34, 35, 36	Application of GIS in land use and land cover.	Understand the need to have image interpretation and application of GIS data for addressing different environmental issues			
37, 38, 39	Application of GIS in water resources.				
4, 41, 42	Application of GIS in land resources.				
43, 44, 45	Application of GIS in environment.				
46, 47, 48	Application of GIS in traffic systems.				

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1690.1	Understand the concept and basics of remote sensing (RS) and geographical information system (GIS).	3						1					3				2
CV1690.2	Know about different satellites and sensors involved in the RS and GIS application.	3											3				2
CV1690.3	Discern the application of RS and GIS in spatial and temporal investigations of geological, climatic and environmental problems.	3				1		1					3				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering Estimating, Costing and Valuation| CV1701| 4 Credits | 3 1 0 4

Session: August 18 – December 18 | Faculty: Shaik Hussain | Class: Core Course

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course and purpose of the course is for students to get familiar with basics of estimation, costing and valuation. Study of this course work includes estimates of building work, applicable rates in a particular zone, different types of contracts and the factors affecting the value of assets, all of this that are crucial for a student to have a promising career as a civil engineer. The student, by the end of the semester would be able to successfully estimate the quantities of construction and cost to undertake the process. The civil engineering market demands a student to be aware of these details to ensure they are employable. Also, the student would be erudite enough to bid contracts at an entry level for the civil engineering structures with ample field and market comparisons according to the current PWD rates which again is one of the most sought out prerequisites few construction companies look out for.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1701.1] Apply the knowledge of mathematics and engineering fundamentals in estimation of a building

[CV1701.2] Perform rate analysis under various existing conditions

[CV1701.3] Understand the basics of Estimation and valuation and able to bid for tenders

[CV1701.4] Analyse and understand various contracts documents and take decisions accordingly

[CV1701.5] Estimate the value of property and formulate future investment plans which increase employability

A. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.
[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.
[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.
[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15

	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments	

Assignment (Formative)	with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

E. Syllabus

Estimation

Introduction, Definition, Types of estimate, approximate estimate.

Units of measurement

IS 1200, Work charged establishment, Plinth area, Carpet area. Estimate of building, doors and windows, RCC work, Different types of roof, Detailed specification for different components of the buildings.

Rate Analysis

Purpose, Factors effecting, Overhead charges, Turn out of work, Rate analysis for different items of building; Contract-Functioning and organization of PWD; Tender and its notification, EMD and Security deposit;

Contracts and Tenders

Contracts, Types of contract, Termination of contract, Work slip qualification of contractor, Responsibilities of engineer, owner, and contractor.

Valuation

Purpose of valuation, Scrap value, Salvage value, Market value, Factors which affect the value, Sinking fund, Year's purchase, Depreciation, Calculation of standard rent.

F. Text Books

1. Dutta B.N., Estimating and Costing in Civil Engineering, UBS Publishers' Distributors Ltd. Sixteenth reprint, 2000.

G. Reference Books

1. Chakraborti M., Estimating, Costing, Specification & Valuation in Civil Engineering, Published by the Author, Sixteenth edition, 2003.

H. Lecture Plan

Lecture Number	**Topics to be covered**	**Session outcome**	**Mode of delivery**	**Corresponding Course outcome**	**Mode of assessing the outcome**
1	,Introduction	Estimation: Introduction	lecture	CV1701.1	Quiz/Assignment/Exam
2	Introduction	Definition, Types of estimate,	lecture	CV1701.1	Quiz/Assignment/Exam

3	Estimate	Approximate estimate and numerical examples	lecture	CV1701.1	Quiz/Assignment/Exam
4	Units	Units of measurement: IS 1200,	lecture	CV1701.1	Quiz/Assignment/Exam
5	Methods	Methods of taking out Estimates	lecture	CV1701.1	Quiz/Assignment/Exam
6	Different components of building	Plinth area, Carpet area. Estimate of building,	lecture	CV1701.1	Quiz/Assignment/Exam
7	Different components of building	Doors and windows,	lecture	CV1701.2	Quiz/Assignment/Exam
8	Different components of building	RCC work,	lecture	CV1701.2	Quiz/Assignment/Exam
9	Different components of building,	Different types of roof	lecture	CV1701.2	Quiz/Assignment/Exam

10	Measurements	Measurement of earth-work by cross-sections,	lecture	CV1701.2	Quiz/Assignment/Exam
11	Measurements	Spot levels,	lecture	CV1701.2	Quiz/Assignment/Exam
12	Measurements,	Contours	lecture	CV1701.2	Quiz/Assignment/Exam
13	Measurements	Mass diagram and its characteristics;	lecture	CV1701.2	Quiz/Assignment/Exam
14	Measurements	Mass diagram and its characteristics;	lecture	CV1701.2	Quiz/Assignment/Exam
15	, Detailed specification	Specification-Definition	lecture	CV1701.3	Quiz/Assignment/Exam
16	Detailed specification,	Types, Principles	lecture	CV1701.3	Quiz/Assignment/Exam
17	Detailed specification	Detailed specification for different components of the buildings;	lecture	CV1701.3	Quiz/Assignment/Exam

18	Rate analysis	Rate Analysis: Purpose, Factors effecting the rates,	lecture	CV1701.3	Quiz/Assignment/Exam
19	Rate analysis	Rate Analysis: Purpose, Factors effecting the rates,	lecture	CV1701.3	Quiz/Assignment/Exam
20	Rate analysis	Overhead charges,	lecture	CV1701.3	Quiz/Assignment/Exam
21	Rate analysis	Turn out of work,	lecture	CV1701.3	Quiz/Assignment/Exam
22	Rate analysis	Rate analysis for different items of building;	lecture	CV1701.3	Quiz/Assignment/Exam
23	Rate analysis for different items of building;	Rate analysis for different items of building;	lecture	CV1701.3	Quiz/Assignment/Exam
24	Contracts	Contract-Functioning and organization of PWD	lecture	CV1701.3	Quiz/Assignment/Exam

25	Contracts;	Contract-Functioning and organization of PWD	lecture	CV1701.3	Quiz/Assignment/Exam
26	Tenders	Tender and its notification	lecture	CV1701.3	Quiz/Assignment/Exam
27	Tenders	EMD and Security deposit;	lecture	CV1701.3	Quiz/Assignment/Exam
28	Contracts	EMD and Security deposit;	lecture	CV1701.3	Quiz/Assignment/Exam
29	Contracts	Contracts: Types of contract	lecture	CV1701.4	Quiz/Assignment/Exam
30	Contracts	Contracts: Types of contract	lecture	CV1701.4	Quiz/Assignment/Exam
31	Contracts,	Termination of contract	lecture	CV1701.4	Quiz/Assignment/Exam
32	, Contracts	Termination of contract	lecture	CV1701.4	Quiz/Assignment/Exam

33	Contracts	Work slip qualification of contractor,	lecture	CV1701.4	Quiz/Assignment/Exam
34	Contracts	Responsibilities of engineer,	lecture	CV1701.4	Quiz/Assignment/Exam
35	Contracts;	Owner and contractor	lecture	CV1701.4	Quiz/Assignment/Exam
36	Valuation	Valuation: Introduction	lecture	CV1701.4	Quiz/Assignment/Exam
37	Valuation	Purpose of valuation,	lecture	CV1701.4	Quiz/Assignment/Exam
38	Valuation	Scrap value,	lecture	CV1701.4	Quiz/Assignment/Exam
39	, Valuation	Salvage value	lecture	CV1701.4	Quiz/Assignment/Exam
40	Valuation	Market value,	lecture	CV1701.5	Quiz/Assignment/Exam
41	Valuation,	Factors which affect the value	lecture	CV1701.5	Quiz/Assignment/Exam
42	Valuation	Factors which affect the value,	lecture	CV1701.5	Quiz/Assignment/Exam

43	Valuation	Sinking fund,	lecture	CV1701.5	Quiz/Assignment/Exam
44	Valuation	Year's purchase	lecture	CV1701.5	Quiz/Assignment/Exam
45	Valuation	Depreciation	lecture	CV1701.5	Quiz/Assignment/Exam
46	Valuation	Depreciation	lecture	CV1701.5	Quiz/Assignment/Exam
47	Revision	Whole course	lecture	CV1701.5	N/A
48	Revision	Whole course	lecture	CV1701.5	N/A

B. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV170 1.1	Apply the knowledge of mathematics and engineering fundamentals in estimation of a building	3	2											1			
CV170 1.2	Perform rate analysis under various existing conditions											3			3		
CV170 1.3	Understand the basics of Estimation and valuation and able to bid for tenders								3		2	3				3	
CV170 1.4	Analyse and understand various contracts documents and take decisions accordingly											2					2
CV170 1.5	Estimate the value of property and formulate future investment plans.											2					2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engg.

Engineering Course Hand-out

WATER RESOURCE ENGINEERING | CV 1702| 4 Credits | 3 1 0 4

Session: 2018-19 (Odd) | Faculty: Meghna Sharma | Class: B.Tech (VII Semester)

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course, targeting students who wish to pursue higher studies in the field of Water Resources Engineering, including Hydrology, Irrigation Engineering, River Engineering, Canal Irrigation, Reservoir Planning and Design of Diversion & Storage Works. Water resources engineering is the science which deals with the conception, planning, design, construction and operations of facilities and structures related with the utilization of water available on the earth. It also deals with control of water and the water quality management for the benefits of mankind.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1702.1]. Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development articulating the professional solution
[CV1702.2]. Identify the sources of water and their characteristics for ensuring the sustainability pertaining to field application and inculcating employability skills
[CV1702.3]. Plan, design and compute different parameters for catchment and water resources system to provide real problem solution and contributing towards professional development and inculcating employability skills
[CV1702.4]. Analyze complex field situations and provide engineering solutions for water management and inculcating employability skills
[CV1702.5]. Analyze the planning, regulation and distribution of Catchment and water Resources System to simulate research and inculcating employability skills

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and

research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **[PO.6]. The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15

(Summative)	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Scope and need of the subject, Available potential and present status of its utilization.

Hydrology: Definition and scope, Hydrologic cycle, Peak flows, rainfall and runoff process, infiltration, flood hydrograph, concept of unit hydrograph.

Irrigation Engineering: Necessity, benefits and ill effects of irrigation; soil water relationships; water requirements of crops; methods of irrigation; waterlogging and design of drainage system.

River Engineering: Basic concepts of resistance and sediment transport in rivers.

Canal Irrigation: Types of canals and their functions; parts of a canal system, preparation of canal project. Methods of design of stable channels – Lacey, Kennedy and Lane's methods; design of lined channel; L –sections and cross sections Types of structures on canal, design considerations from surface and sub-surface flows, Energy dissipation. Falls, cross- drainage works, cross and distributary head regulators.

Reservoir Planning: Purpose and types; investigations; reservoir capacity, reservoir sedimentation.

Design of Diversion and Storage works: Diversion head works; River training works; Dams- Gravity and earth dams their functions and basic principles of design.

F. TEXT BOOKS

1. *Singh B., Fundamentals of Irrigation Engineering, Nem Chand & Bros, Roorkee, 9th Edn. 1997.*

G. REFERENCE BOOKS

1. *Modi P.N., Water resources and Water Power Engineering, Standard Book House Publications, Delhi 1988.*
2. *Varshney R.S., Gupta S.C. and Gupta R.L., Theory and Design of Irrigation Structures, Vol.1, Channels and Tube Wells, Nem Chand & Bros, 7 th Edn. 2000.*
3. *Varshney R.S., Gupta S.C. and Gupta R.L., Theory and Design of Irrigation Structures, Vol.2, Canals and Storage Works, Nem Chand & Bros, 6 th Edn. 1993.*
4. *Viessman and Knapp, Introduction to Hydrology, Harper and Row Publishers, Singapore 1989.*

H. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1	**Introduction**	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Lecture	**CV1702.1**	Mid Term I, Quiz & End Term
2	Scope and need of the subject, Available potential and present status of its utilization	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Flipped Classroom	**CV1702.1**	Mid Term I, Quiz & End Term
3	**Hydrology** Hydrology: Definition, scope and Hydrologic cycle.	Identify the sources of water and their characteristics	Lecture	**CV1702.2**	Mid Term I, Quiz & End Term
4		Identify the sources of water and their characteristics	Lecture	**CV1702.2**	Mid Term I, Quiz & End Term
5	Rainfall: optimum	Plan, design and compute	Guided	**CV1702.3**	Mid Term I, Quiz &

	number of rain gauges in a catchment	different parameters for catchment and water resources system.	Self-Study		End Term
6	Estimation of missing rainfall data	Plan, design and compute different parameters for catchment and water resources system.	Lecture	**CV1702.3**	Mid Term I, Quiz & End Term
7	Average rainfall depth over an area	Plan, design and compute different parameters for catchment and water resources system.	Lecture	**CV1702.3**	Mid Term I, Quiz & End Term
8	Mass rainfall curve & hyetograph	Plan, design and compute different parameters for catchment and water resources system.	Lecture	**CV1702.3**	Mid Term I, Quiz & End Term
9	Runoff, components of runoff, factors affecting runoff	Plan, design and compute different parameters for catchment and water resources system.	Lecture	**CV1702.3**	Mid Term I, Quiz & End Term
10	Infiltration, Factors affecting infiltration rates, Infiltration Indices	Plan, design and compute different parameters for catchment and water resources system.	Activity (Think Pair Share)	**CV1702.3**	Mid Term I, Quiz & End Term

11	Flood hydrograph, concept of unit hydrograph.	Plan, design and compute different parameters for catchment and water resources system.	Lecture	**CV1702.3**	Assignment No.1
12	**Irrigation Engineering** Necessity, benefits and ill effects of irrigation	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development.	Lecture	**CV1702.1**	Assignment No.1
13		Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development.	Activity (Jigsaw)	**CV1702.1**	Assignment No.1
14	Types of Irrigation	Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Assignment No.1
15	Water requirement of crops: crop seasons in India, factors affection water requirement, consumptive use of water	Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Assignment No.1

16	Irrigation requirements, efficiencies, duty of water	Plan, design and compute different parameters for catchment and water resources system	Flipped Class	**CV1702.3**	Assignment No.1
17	Numerical & Factors affecting duty.	Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Assignment No.1
18	Soil moisture irrigation relation, water logging, causes of water logging.	Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Mid Term II, Quiz & End Term
19	Ill effects of water logging, Prevention measure.	Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Mid Term II, Quiz & End Term
20	Drainage systems, Design of open drain.	Plan, design and compute different parameters for catchment and water resources system	Activity (Think Pair Share)	**CV1702.3**	Mid Term II, Quiz & End Term
21	**River Engineering** Basic concepts of resistance and sediment transport in rivers.	Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Mid Term II, Quiz & End Term

22		Plan, design and compute different parameters for catchment and water resources system	Lecture	**CV1702.3**	Mid Term II, Quiz & End Term
23	**Canal Irrigation** Canal Irrigation, types of distribution system, types of canals	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Lecture	**CV1702.1**	Mid Term II, Quiz & End Term
24		Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Lecture	**CV1702.1**	Mid Term II, Quiz & End Term
25	Preparation of canal project, Investigations, canal alignment	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term
26	Methods of design of stable channel- lacey, Kennedy & lane. Comparison of methods.	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term
27	Design of lined channel.	Analyze complex field situations and	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term

		provide engineering solutions for water management.			
28	L –sections and cross sections Types of structures on canal	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term
29	design considerations from surface and sub-surface flows	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term
30	Energy dissipation	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term
31	Canal Falls and types.	Analyze complex field situations and provide engineering solutions for water management.	Lecture, Activity	**CV1702.4**	Mid Term II, Quiz & End Term
32	Design of Sarda type fall	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Mid Term II, Quiz & End Term
33	Cross drainage works, types of CD works,	Analyze complex field situations and	Lecture	**CV1702.4**	Assignment No. 2

	types and site selection	provide engineering solutions for water management.			
34	Canal Regulation works, functions, types of regulators.	Analyze complex field situations and provide engineering solutions for water management.	Lecture, Activity	**CV1702.4**	Assignment No. 2
35	**Reservoir Planning** Reservoir Planning: Purpose and types	Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Assignment No. 2
36		Analyze complex field situations and provide engineering solutions for water management.	Lecture	**CV1702.4**	Assignment No. 2
37	Investigations; reservoir capacity, reservoir sedimentation.	Analyze the planning, regulation and distribution of Catchment and water Resources System	Lecture	**CV1702.5**	Quiz & End Term
38	**Design of Diversion and Storage works** Planning of diversion head works	Analyze the planning, regulation and distribution of Catchment and water Resources System	Lecture	**CV1702.5**	Quiz & End Term
39		Analyze the planning, regulation and	Lecture	**CV1702.5**	Quiz & End Term

		distribution of Catchment and water Resources System			
40	Layout of diversion head works	Analyze the planning, regulation and distribution of Catchment and water Resources System	Lecture	**CV1702.5**	Quiz & End Term
41	Basic principles of design of hydraulic structures	Analyze the planning, regulation and distribution of Catchment and water Resources System	Lecture	**CV1702.5**	Quiz & End Term
42	Bligh's creep theory, khosla's solution for a horizontal floor.	Analyze the planning, regulation and distribution of Catchment and water Resources System	Lecture	**CV1702.5**	Quiz & End Term
43	Gravity dam & earth dams	Analyze the planning, regulation and distribution of Catchment and water Resources System	Activity (Think Pair Share)	**CV1702.5**	Quiz & End Term
44	Forces acting on gravity dams.	Analyze the planning, regulation and distribution of Catchment and water Resources System	Lecture	**CV1702.5**	Quiz & End Term
45	types of earth dams	Analyze the planning, regulation and	Activity (Think Pair	**CV1702.5**	Quiz & End Term

		distribution of Catchment and water Resources System	Share)		
46	Basic principles of design	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Lecture	**CV1702.1**	Quiz & End Term
47	Revision	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Activity (Think Pair Share)	**CV1702.1**	Quiz & End Term
48	Spillover	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development	Activity (Think Pair Share)	**CV1702.1**	Quiz & End Term

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1702.1	Apply knowledge of basic sciences and engineering to analyze water resources systems for socio-economic development articulating the professional solution and inculcating employability skills	3							1					3		3	1
CV1702.2	Identify the sources of water and their characteristics for ensuring the sustainability pertaining to field application and inculcating employability skills		2	2								2			3	3	
CV1702.3	Plan, design and compute different parameters for catchment and water resources system to provide real problem solution and contributing towards professional development and inculcating employability skills				2	2								2	3		3
CV1702.4	Analyze complex field situations and provide engineering solutions for water management and inculcating employability skills						2		2	3				2	3	3	
CV1702.5	Analyze the planning, regulation and distribution of Catchment and water Resources System to simulate research and inculcating employability skills			1						1	1	3		3		3	2

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

Department of Civil Engineering
Course Plan

Building Construction and Project Management | CV1763 | 3 Credits | 3 0 0 3

Session: July 2018 – December 2018 | Faculty: Dr. Bhavna Tripathi | Class: Program Elective Course

A. Introduction: Construction is the most important field related activity of Civil Engineering discipline. This course covers basic terminology and fundamentals of different types of buildings, their components, temporary arrangements, and sequence of construction activities. The course also includes knowledge of construction project management, network preparation and its analysis. This course aims at providing practical knowledge and skills to the fresh graduates to be able to work at as site engineer and tackle everyday challenges related with construction and management of buildings.

B. Course Outcomes: At the end of the course, students will be able to:

[CV1763.1]. Recall types of buildings as per NBC and functions of its components necessary for employment of civil engineer.

[CV1763.2]. Apply the knowledge of construction techniques and components involved in building construction necessary for employment as site engineer.

[CV1763.3]. Apply the elements of construction project management and create work breakdown structure.

[CV1763.4]. Create construction project networks and analyse using PERT and CPM techniques for being able to work as an entrepreneur.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Quiz (Formative)	Four quizzes will be taken, out of which, best three will be considered for evaluation and added for compilation of CWS marks.	
Assignment (Formative)	Four assignments will be given, of which, best three will be considered for evaluation and added for compilation of CWS marks. All students are expected to participate and perform these assignments with full zeal since the assignment/ activity/ flipped classroom/ Class assignment participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Building types & components: Definition and classification of buildings, load bearing and framed structure. Sequence of construction activity and co-ordination, building components and their functions, requirement of foundation, shallow and deep foundations, floor types and selection of flooring, types of stairs, classification of roofs, types of pitched roofs, trussed roofs, steel roof trusses.

Brick and Stone Masonry: different types of bonds in brick and stone masonry, merits and limitations, Comparison between stone and brick masonry.

Damp Proofing: Causes and effects of dampness, methods and materials used for damp proofing.

Joints: Requirements of construction joints and different types.

Temporary structural measures: Types & methods of shoring, underpinning and scaffolding. Fabrication and Erection work: Fabrication, handling, transportation, and erection of steel members and structures, difference between prefabricated, precast and cast-in-situ construction.

Construction Project Management: Characteristics of a construction project, Stages of Construction Project, Construction team, functions of project management, Work Breakdown Structure, scheduling techniques.

Network preparation and analysis: Rules for drawing a network diagram, PERT and CPM Analysis, calculation of Slack, Critical Path, Floats, and probability of meeting scheduled completion time.

F. TEXT BOOKS

1. B.C. Punmia, A.K. Jain, and A.K. Jain, *Building Construction*, Laxmi Publications, 11th Edition, 2016.
2. K.K. Chitkara, *Construction Project Management: Planning, Scheduling and Controlling*, McGraw Hill Education, 3rd Edition, 2014.

G. REFERENCE BOOKS

1. S.K. Sarkar and S. Saraswati, *Construction Technology*, Oxford University Press, 2008
2. B.C. Punmia, and K.K. Khandelwal, *Project Planning and Control with PERT and CPM,* Laxmi Publications, 4th Edition, 2016.

H. Lecture Plan:

Lecture No.	Topics to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to course, its outcome, assessment etc	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	Definition and classification of buildings	Identify different types of buildings and reason for categorisation	Lecture & Activity	CV1763.1	Quiz, Mid Term Exam – I End Term Exam
	Activity: Expert Lecture	Understand the requirement of soil improvement techniques and techniques through case studies	Lecture	CV1763.1	NA
3	Sequence of construction activity and co-ordination	Identify sequential order of construction activities and generate understanding for construction management	Lecture	CV1763.1 and CV1763.3	Quiz and assignment
4	Building components and their functions	Recall the functions of building components	Lecture	CV1763.1	Quiz, Mid Term Exam – I End Term Exam
5,6	Foundations: Shallow and deep foundation	Recall knowledge of different types of foundations and their suitability	Lecture	CV1763.1	Quiz, Mid Term Exam - I End Term Exam
	Activity: Quiz	Recall the topics related with CO1	Online	CV1763.1	NA
7	Floor types and selection of flooring	Explain various types of floors	Lecture	CV1763.1	Quiz, End Term Exam
8	Types of stairs	Explain the function and types of Stairs	Lecture and assignment	CV1763.1	Assignment, Mid Term Exam – I End Term Exam
9, 10, 11	Classification of roofs, Pitched Roofs, Trussed Roofs, Steel roof trusses	Explain various types of roofs	Lecture and assignment	CV1763.1	Quiz, End Term Exam
13	Activity: Assignment	Discussion on assignment	Discussion in class	CV1763.1	NA
14, 15, 16 17	Brick and Stone Masonry	Apply knowledge of construction techniques	Lecture	CV1763.2	Quiz, Mid Term Exam – I End Term Exam
18, 19	Damp Proofing- Causes and effects of dampness	Apply knowledge of construction techniques	Lecture	CV1763.2	Quiz, Mid Term Exam - I End Term Exam
20	Construction Joints and its types	Apply knowledge of construction joints	Lecture	CV1763.2	Quiz, Mid Term Exam - I End Term Exam

Lecture No.	Topics to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
	Activity: Assignment	Discussion on case studies	Discussion	CV1763.2	NA
21, 22	Types & methods of shoring, underpinning and scaffolding.	Apply knowledge of construction techniques	Lecture	CV1763.2	Quiz, Mid Term Exam - I End Term Exam
23, 24	Fabrication and Erection work	Apply knowledge of construction techniques	Lecture	CV1763.2	Quiz, Mid Term Exam - I End Term Exam
	Activity: Quiz	Knowledge assessment related to CO 2	Online	CV1763.2	Quiz
25	Characteristics of a construction project	Understand difference between construction project and any other industrial project	Lecture	CV1763.3	Quiz, Mid Term Exam – II, End Term Exam
26	Stages of Construction Project	Understand stages of construction and liabilities of different parties involved.	Lecture	CV1763.3	Quiz, Mid Term Exam – II, End Term Exam
27, 28	Construction team, functions of project management	Identify responsibilities of different parties involved	Flipped Class	CV1763.3	Quiz, Mid Term Exam – II, End Term Exam
29, 30	Work Break down Structure	Create work breakdown structure		CV1763.3	Quiz, Mid Term Exam – II, End Term Exam
	Activity: Quiz	Knowledge assessment related to CO 3	Online	CV1763.3	Quiz
31	Scheduling techniques	Create construction project networks	Flipped Class	CV1763.4	Quiz, Mid Term Exam – II, End Term Exam
32	Rules for drawing a network diagram	Create construction project networks	Lecture	CV1763.4	Quiz, Mid Term Exam – II, End Term Exam
33, 34	Activity: Network Preparation	Analyse and manage construction project using PERT and CPM techniques	Lecture	CV1763.4	Quiz, Mid Term Exam – II, End Term Exam
35, 36	PERT and CPM Analysis	Analyse and manage construction project using PERT and CPM techniques	Lecture	CV1763.4	Quiz, Mid Term Exam – II, End Term Exam
37, 38	Activity: Problems solving using PERT and CPM network analysis	Analyse and manage construction project using PERT and CPM techniques	Lecture	CV1763.4	Quiz, Mid Term Exam – II, End Term Exam

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV176 3.1	Recall types of buildings as per NBC and functions of its components necessary for employment of civil engineer.			2			3							2		3	
CV176 3.2	Apply the knowledge of construction techniques and components involved in building construction necessary for employment as site engineer.			2	3										2	3	2
CV176 3.3	Apply the elements of construction project management and create work breakdown structure.			1								3				3	2
CV176 3.4	Create construction project networks and analyse using PERT and CPM techniques for being able to work as an entrepreneur.			2								3	1		2	3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Environmental Impact Assessment | CV 1766 | 3 Credits | 3 0 0 3

Session: Jul 18-Nov 18 | Faculty: Dr. Nitin Goyal | Class: B. Tech Civil VII SEM

A. Introduction: This course is offered by Dept. of Civil Engineering for seventh semester students as program elective, targeting students who want to pursue higher studies in the field of environmental engineering, including environmental management and sustainable development. The course offers in depth knowledge of the need for environmental protection from pollution caused by developmental projects. The students will learn various methods for impact identification, evaluation and mitigation. The course will include activities, such as group discussions, quizzes, and projects, focusing on the development of industry ready skills.

B. Course Outcomes: At the end of the course, students will be able to:

[CV 1766.1]. Describe the importance of EIA, steps involved in EIA methodology and the need to protect the environment to promote sustainable development
[CV 1766.2]. Analyse environmental impacts of developmental projects and the characteristics of these impacts for enhancing employability skills
[CV 1766.3]. Recall the mitigation methodology and draft EIA report
[CV 1766.4]. Evaluate the impact of developmental projects in societal and environmental context

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members with discharge of social responsibilities as a civil engineer and engage in independent and lifelong learning for global betterment

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Definition and importance: Planning and Management of impact studies; Impact identification: Matrices, Networks, and Checklists. Description of affected environment, Indices and indicators for describing affected environment;

Prediction and Assessment of Impacts: Air, Surface water, Soil and groundwater, Noise, Biological, Cultural and socio-economic environment, Decision methods for evaluation of alternatives, Public participation in environmental decision making;

Documentation and environmental monitoring: Case studies, Environmental audit, Meaning, Importance.

F. TEXT BOOKS

W.L. Canter, Environmental Impact Assessment, McGraw Hill International editions, New York 1996.

G. REFERENCE BOOKS

C.H. Eccleston, “Environmental Impact Assessment: A Guide to Best Professional Practices” CRC Press, 2017.

P. Morris and R. Therivel, “Methods of Environmental Impact Assessment”, Taylor & Francis, 2001.

A.K. Biswas and S.B.C. Agarwal, “Environmental Impact Assessment for Developing Countries”, Elsevier, 1992.

P. Wathern, “Environmental Impact Assessment: Theory and Practice”, Routledge, 1988.

H. Lecture Plan:

Lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
L1	Introduction to the concept of EIA	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L2	Perspectives on Sustainable Development	Describing the importance of EIA , Evaluating the impact of developmental projects	Lecture	CV1766.1, CV1766.4	Mid Term I, Quiz & End Term
L3	Purpose, Aim and Limitations of EIA	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L4	Class Activity – Group Discussion	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L5	Nature and scope of environmental issues	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L6	Typology of environmental impacts	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term I, Quiz & End Term
L7	Key elements of EIA process	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L8	Introduction to steps in an EIA process	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L9	Screening of EIA projects	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L10	Framework for Screening	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L11	Preliminary EIA	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L12	Criteria for the determination of the need for, and level of, EIA	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L13	Class Activity – Quiz	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L14	Scoping of EIA projects	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L15	Purpose and Objectives of Scoping	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term

L16	Methods of Scoping	Describing the importance of EIA	Lecture	CV1766.1	Mid Term I, Quiz & End Term
L17	Activities involved in Scoping	Describing the importance of EIA	Lecture	CV1766.1	Mid Term II, Quiz & End Term
L18	Class Activity – Group Discussion	Describing the importance of EIA	Lecture	CV1766.1	Mid Term II, Quiz & End Term
L19	Environmental Impacts and identification of impacts	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L20	Impact identification methods	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L21	Checklists and Matrices	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L22	Networks and overlays	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L23	Baseline studies	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L24	Characteristics of environmental impacts	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L25	Presentation of impact results and uncertainty in impacts	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L26	Mitigation of Impacts	Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.3	Mid Term II, Quiz & End Term
L27	Elements of mitigation	Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.3	Mid Term II, Quiz & End Term
L28	Approaches to mitigation	Analyse environmental impacts of developmental projects	Lecture	CV1766.2	Mid Term II, Quiz & End Term
L29	Components of Environmental management plan (EMP)	Analyse environmental impacts of developmental projects, Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.2, CV1766.3	Mid Term II, Quiz & End Term
L30	Class Activity – Quiz	Analyse environmental impacts of developmental projects, Learning the mitigation methodology and	Lecture	CV1766.2,	Mid Term II, Quiz

		drafting EIA report		CV1766.3	& End Term
L31	EIA reporting	Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.3	End Term
L32	Elements of an EIA report	Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.3	End Term
L33	Guidelines for effective EIA report	Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.3	End Term
L34	Environmental audit (EA)	Learning the mitigation methodology and drafting EIA report	Lecture	CV1766.3	End Term
L35	Types of EA and EA methodology	Learning the mitigation methodology and drafting EIA report, Evaluating the impact of developmental projects	Lecture	CV1766.3, CV1766.4	End Term
L36	Class Activity – Group Discussion and Quiz	Analyse environmental impacts of developmental projects, Learning the mitigation methodology and drafting EIA report	Lecture, Activity	CV1766.2, CV1766.3	End Term
L37	EIA case studies	Evaluating the impact of developmental projects	Flipped classroom	CV1766.4	End Term
L38	EIA case studies	Evaluating the impact of developmental projects	Lecture, Activity	CV1766.4	End Term
L39	EIA case studies	Evaluating the impact of developmental projects	Lecture, Activity	CV1766.4	End Term
L40	EIA case studies	Evaluating the impact of developmental projects	Lecture, Activity	CV1766.4	End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV1766.1	Describe the importance of EIA, steps involved in EIA methodology and the need to protect the environment to promote sustainable development	1	3		2			3			1		1	3			
CV 1766.2	Analyse environmental impacts of developmental projects and the characteristics of these impacts for enhancing employability skills		2	3		1		1				1			2		
CV 1766.3	Recall the mitigation methodology and draft EIA report					3		1	2			1		1	3	1	
CV 1766.4	Evaluate the impact of developmental projects in societal and environmental context	3				2	3	2	1	2		1		1		1	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Subject Coordinator/Course Instructor **Head Of Department** **Class Representative (Sec A)** **Class Representative (Sec B)**

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering

DEPARTMENT OF CIVIL ENGINEERING

Course Hand-out

Design of Earthquake Resistant Structures | CV1767 | 3 Credits | 3 0 0 3

Session: Aug 18 – Nov 18 | Faculty: Charanjeet Singh | Class: B.Tech. Civil VII SEM

A. Introduction: This course is offered by Dept. of Civil Engineering as a Departmental elective, targeting students who wish to pursue higher studies in the field of Earthquake Engineering. The course offers in depth knowledge of Generation and Propagation of Seismic waves, Free and Forced vibration of Single degree damped and un-damped systems, Resonance, Multiple degree of freedom system, Structural Irregularities, Ductile Detailing and retrofitting methods. Case studies of important earthquakes have been emphasized in this course. Students are expected to have background knowledge on general design of strength of materials, design of reinforced concrete structures and structural analysis for better learning.

B. Course Outcomes: At the end of the course, students will be able to:

[CV 1767.1] An ability to understand the load transfer mechanism in structures.

[CV 1767.2] To do investigative work in design structures for better employment opportunity.

[CV 1767.3] Gain knowledge to do inter disciplinary work for entrepreneurial skills enhancement.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Design economic, environment friendly, sustainable civil engineering structures keeping in view national and social requirements.

[PSO.2]. Conduct investigation, analysis and interpretation of the results using modern scientific tools and technical skills for solving complex civil engineering problem.

[PSO.3]. Manage/ execute civil engineering projects effectively and ethically as a member or/and leader in diverse teams.

[PSO.4]. Communicate effectively with multidisciplinary members and engage in independent and lifelong learning for global betterment.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Plate tectonics, Elastic rebound theory of earthquake, Seismic zoning map of India, Seismic waves, Seismograms, Earthquake magnitude and intensity. Introduction to theory of vibration: Free vibration of single degree un-damped and damped systems. Forced vibration (Harmonic Loading) of single degree un-damped and damped systems. Introduction to Resonance and MDOF system, Primary and secondary effects of earthquake.
Structural irregularities: the performance of RC buildings during Earthquakes: Vertical irregularities, Plan configuration problems; equivalent static method (is 1893). Ductile detailing of RC frames as per IS 13920 (1993). Restoration and retrofitting: of exciting structures. Case studies: of important earthquakes: Indian earthquakes, Major world earthquakes.

F. TEXT BOOKS

1. P. Agarwal and M. Shrikhande, Earthquake Resistant Design of Structures, Prentice-Hall of India Private Limited, New Delhi. 2006.

G. REFERENCE BOOKS

1. C.V.R Murty, Earthquake Tips- Learning Earthquake Design and Construction, National Information Centre of Earthquake Engineering, IIT Kanpur 2005.

2. Anil K Chopra, Dynamics of structures, Theory and Application of Earthquake Engineering, Pearson Publication.

3. IS: 1893 (Part 1) - 2002, Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.

4. IS: 13920 - 1993, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces- Code of Practice, Bureau of Indian Standards, New Delhi.

H. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1,2	Introduction	Plate tectonics, elastic rebound theory of earthquake	Lecture, PPT	CV1767.1	Online quiz 1 and 1st Sessional Exam
3,4	Introduction	Seismic zoning map of India, seismic waves, seismograms,	Lecture, PPT	CV1767.1	
5,6	Introduction	Earthquake magnitude and intensities.	Lecture, PPT	CV1767.1	
7,8,9	Introduction to theory of vibrations	Free vibration of SDOF system.	Lecture, PPT	CV1767.1	Online quiz1 and 1st Sessional
10,11	Introduction to theory of vibrations	Free vibration of Un-damped SDOF system.	Lecture, PPT	CV1767.1	
12,13	Introduction to theory of vibrations	Free vibration of Damped SDOF system.	Lecture, PPT	CV1767.1	
14,15,16	Introduction to theory of vibrations	Forced vibration of SDOF system.	Lecture, PPT	CV1767.2	Online quiz 2 and 1st Sessional
17,18,19	Introduction to theory of vibrations	Forced vibration of Un-damped SDOF system.	Lecture, PPT	CV1767.2	
18,19,20	Introduction to theory of vibrations	Forced vibration of Damped SDOF system.	Lecture, PPT	CV1767.2	Online quiz 2 and 1st Sessional
21,22,23,24	Introduction to theory of vibrations	Numerical Problems	Lecture, PPT	CV1767.2	
25,26,27	Introduction to theory of vibrations	Introduction to Resonance and MDOF system	Lecture, PPT	CV1767.2	
28,29,30	Introduction to theory of vibrations	Primary and secondary effects of earthquake.	Lecture, PPT	CV1767.2	
FIRST SESSIONAL EXAM					
31,32	Effect of Structural Irregularities on the performance of RC buildings during Earthquake	Plan configuration problem.	Lecture, PPT	CV1767.3	Online quiz 3 and 2st Sessional
33,34	Effect of Structural Irregularities on the performance of RC buildings during Earthquake	Introduction to Equivalent Static method (IS 1893)	Lecture, PPT	CV1767.3	
35,36,37,38	Effect of Structural Irregularities on the performance of RC buildings during Earthquake	Numerical on Equivalent Static Method	Lecture, PPT	CV1767.3	
39,40	Effect of Structural Irregularities on the performance of RC buildings during Earthquake	Introduction to Ductile detailing of RC frames as per IS 13920-1993	Lecture, PPT	CV1767.3	Online quiz 4 and 2st Sessional
41,42,43,44	Effect of Structural Irregularities on the performance of RC buildings during Earthquake	Numerical on Ductile detailing of RC frames.	Lecture, PPT	CV1767.3	
45,46,47	Effect of Structural Irregularities on the performance of RC buildings during Earthquake	Restoration and retrofitting of exciting structures.	Lecture, PPT	CV1767.3	
48,49	Case studies of important earthquake	Indian earthquake, Major National and International earthquakes.	Lecture, PPT	CV1767.3	

SECOND SESSIONAL EXAM					
50	Assignment	Assignment			
51,52	Revision	Revision			
END SEMESTER EXAM					

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CV 1767.1	**An ability to understand the load transfer mechanism in steel structures.**	3	3	1								1	1		1		
CV 1767.2	**To do investigative work in design steel structures for better employment opportunity.**	3	3	3	2	1		1	1			1	1	3	2		
CV 1767.3	**Gain knowledge to do inter disciplinary work for entrepreneurial skills enhancement.**	3	3	3	1	2	1	1	1	1		1	2	3	3	1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation