																						07-06-202	5 03:44:52 PM
					Ma	hara	shtr	'a Sta	ate Board Of Techni	cal Education	ı, Mum	bai											
					Learni	ing a	nd A	sses	sment Scheme for <b>P</b>	ost S.S.C Dip	loma C	ourses											
Pro	ogramme Name	: Dip	loma In	Civil Eng	ineering /	Civil	& R	ural	Engineering / Constru	ction Technolog	gy / Civi	l & Environ	menta	l Eng	ineer	ing							
Pro	ogramme Code	: CE	/ CR / C	S/LE					With H	Effect From Aca	ademic Y	lear	: 202	3-24									
Du	ration Of Programme	: 6 S	emester						Durati	on			: 16 V	VEEK	S								
Ser	nester	: Fou	ırth	NCrF	Entry Lev	el : 3	.5		Schem	e			: K										
									Learning Scheme						A	ssess	ment	t Sch	eme				
Sr		Abbrovation	Course	Course	Total IVS Hug	Actual Contact Hrs./Week		al ict 'eek	Self Learning	Notional		Paper	Theory			Based on		n LL & TL		Based on Self			
No	Course Thie	ADDrevation	Туре	Code	for Sem.				(Activity/	Learning Hrs	Creatis	Duration	1				Practical			Learning		Total Marks	
					ior Senii	CL	TL	LL	Project)	ject) /Week (hrs.)	FA- TH	SA- TH	То	tal	FA-	PR	SA-	PR	SLA				
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
(Al	l Compulsory)	-			-																		
1	ENVIRONMENTAL EDUCATION AND SUSTAINABILITY	EES	VEC	314301	2	3	-	-	1	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125
2	RAILWAY, BRIDGE AND TUNNEL ENGINEERING	RBT	DSC	314312	3	4	-	-	2	6	3	3	30	70	100	40	-	-	-	-	25	10	125
3	HYDRAULICS	HYD	DSC	314303	-	4	-	2	2	8	4	3	30	70	100	40	25	10	25@	10	25	10	175
4	ESTIMATING, COSTING AND VALUATION	ECV	DSC	314313	-	4	-	4	-	8	4	4	30	70	100	40	50	20	25#	10	-	-	175
5	WATER AND WASTEWATER ENGINEERING	WWE	DSC	314314	2	4	-	2	-	6	3	3	30	70	100	40	25	10	-	-	-	-	125
6	GEOTECHNICAL ENGINEERING	GTE	DSC	314315	1	3	-	2	3	8	4	3	30	70	100	40	25	10	25#	10	25	10	175
	Tota	al			8	22		10	8		20		180	420	600		125		75		100		900

Abbreviations : CL- Classroom Learning , TL- Tutorial Learning, LL-Laboratory Learning, FA - Formative Assessment, SA - Summative Assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment Legends : @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.

2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.

3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.

4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks

5. 1 credit is equivalent to 30 Notional hrs.

6. \* Self learning hours shall not be reflected in the Time Table.

7. \* Self learning includes micro project / assignment / other activities.

Course Category : Discipline Specific Course Core (DSC), Discipline Specific Elective (DSE), Value Education Course (VEC), Intern./Apprenti./Project./Community (INP), AbilityEnhancement Course (AEC), Skill Enhancement Course (SEC), GenericElective (GE)

ENVIRONMENTAL	EDUCATION AND SUSTAINABILITY	Course Code : 314301
Programme Name/s	: Architecture Assistantship/ Automobile Engineering./ A Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automatio Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Teo Engineering/ Civil & Rural Engineering/ Construction Technology/ Co Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Elec Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electrical Power System/ Electronics & Communication Electronics Engineering/ Food Technology/ Computer H Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & E Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Medical Engineering/ Printing Technology/ Polymer Technology/ Surface Coat Science/ Textile Technology/ Electronics & Computer Engg./ Trav Manufactures/	Artificial Intelligence/ on and Robotics/ Architecture/ chnology/ Computer omputer Science & Engineering/ ctronics/ Data Sciences/ Electronics Engineering/ Engg./ ardware & Maintenance/ ter Science & Information Cnvironmental Engineering/ Electronics/ Production ing Technology/ Computer vel and Tourism/ Textile
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ C DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX	CR/ CS/ CW/ DC/ DD/ DE/ 5/ IX/ IZ/ LE/ ME/
Semester	: Fourth	
Course Title	: ENVIRONMENTAL EDUCATION AND SUSTAINAB	BILITY
Course Code	: 314301	

## I. RATIONALE

The survival of human beings is solely depending upon the nature. Thus, threats to the environment directly impact on existence and health of humans as well as other species. Depletion of natural resources and degradation of ecosystems is accelerated due to the growth in industrial development, population growth, and overall growth in production demand. To address these environmental issues, awareness and participation of individuals as well as society is necessary. Environmental education and sustainability provide an integrated, and interdisciplinary approach to study the environmental systems and sustainability approach to the diploma engineers.

## II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Resolve the relevant environmental issue through sustainable solutions

## **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Identify the relevant Environmental issues in specified locality.
- CO2 Provide the green solution to the relevant environmental problems.
- CO3 Conduct SWOT analysis of biodiversity hotspot
- CO4 Apply the relevant measures to mitigate the environmental pollution.

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## ENVIRONMENTAL EDUCATION AND SUSTAINABILITY

#### Course Code : 314301

• CO5 - Implement the environmental policies under the relevant legal framework.

## IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				L	ear	ninş	g Sch	eme	1 m				A	ssess	ment	Sche	eme				
Course Code	Course Title	Abbr	Course Category/s	A C Hr	Actual Contact Irs./Wee		t <u>k</u> SLHNL		Credits	Paper		Theory			Based on LL & TL Practical			&	Based on SL		Total
				CL	TL	LL			_	Duration	FA- TH	SA- TH	To	tal	FA-	PR	SA-	PR	SL	A	IVIALKS
									<b>.</b>		Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314301	ENVIRONMENTAL EDUCATION AND SUSTAINABILITY	EES	VEC	3	-		1	4	2	1.5	30	70*#	100	40	1	-	-	-	25	10	125

## Total IKS Hrs for Sem. : 2 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination Note :

- 1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- 2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
- 3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
- 4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
- 5. 1 credit is equivalent to 30 Notional hrs.
- 6. \* Self learning hours shall not be reflected in the Time Table.
- 7. \* Self learning includes micro project / assignment / other activities.

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

C	NI	2
Sr.	LN	t

Theory Learning Outcomes (TLO's)aligned to CO's.

Learning content mapped with Theory Learning Outcomes (TLO's) and CO's. Suggested Learning Pedagogies.

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain the need of studying environment and its components. TLO 1.2 Investigate the impact of population growth and industrialization on the relevant environmental issues and suggest remedial solutions TLO 1.3 Explain the Concept of 5 R w.r.t. the given situation TLO 1.4 Elaborate the relevance of Sustainable Development Goals in managing the climate change TLO 1.5 Explain the concept of zero carbon-footprint with carbon credit	Unit - I Environment and climate change 1.1 Environment and its components, Types of Environments, Need of environmental studies 1.2 Environmental Issues- Climate change, Global warming, Acid rain, Ozone layer depletion, nuclear accidents. Effect of population growth and industrialization 1.3 Concept of 5R, Individuals' participation in i) 5R policy, ii) segregation of waste, and iii) creating manure from domestic waste 1.4 Impact of Climate change, Factors contributing to climate change, Concept of Sustainable development, Sustainable development Goals (SDGs), Action Plan on Climate Change in Indian perspectives 1.5 Zero Carbon footprint for sustainable development, (IKS-Enviornment conservation in vedic and pre-vedic India)	Lecture Using Chalk-Board Presentations
2	TLO 2.1 Justify the importance of natural resources in sustainable development TLO 2.2 Explain the need of optimum use of natural resources to maintain the sustainability TLO 2.3 Differentiate between renewable and non-renewable sources of energy TLO 2.4 Suggest the relevant type of energy source as a green solution to environmental issues	Unit - II Sustainability and Renewable Resources 2.1 Natural Resources: Types, importance, Causes and effects of depletion. (Forest Resources, Water Resources, Energy Resources, Land resources, Mineral resources), (IKS- Concepts of Panchmahabhuta) 2.2 Impact of overexploitation of natural resources on the environment, optimum use of natural resources 2.3 Energy forms (Renewable and non- renewable) such as Thermal energy, nuclear energy, Solar energy, Wind energy, Geothermal energy, Biomass energy, Hydropower energy, biofuel 2.4 Green Solutions in the form of New Energy Sources such as Hydrogen energy, Ocean energy & Tidal energy	Lecture Using Chalk-Board Presentations
3	TLO 3.1 Explain the characteristics and functions of ecosystem TLO 3.2 Relate the importance of biodiversity and its loss in the environmental sustainability TLO 3.3 Describe biodiversity assessment initiatives in India TLO 3.4 Conduct the SWOT analysis of the biodiversity hot spot in India TLO 3.5 Explain the need of conservation of biodiversity in the given situation	<ul> <li>Unit - III Ecosystem and Biodiversity</li> <li>3.1 Ecosystem - Definition, Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem, Functions of ecosystem</li> <li>3.2 Biodiversity - Definitions, Levels, Value, and loss of biodiversity</li> <li>3.3 Biodiversity Assessment Initiatives in India</li> <li>3.4 SWOT analysis of biodiversity hot spot in India</li> <li>3.5 Conservations of biodiversity - objects, and laws for conservation of biodiversity</li> </ul>	Lecture Using Chalk-Board Presentations Video Demonstrations

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ENVL	RONMENTAL EDUCATION AND S	SUSTAINABILITY Cou	<b>Course Code : 314301</b>		
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.		
4	TLO 4.1 Classify the pollution based on the given criteria TLO 4.2 Justify the need of preserving soil as a resource along with the preservation techniques TLO 4.3 Maintain the quality of water in the given location using relevant preventive measures TLO 4.4 State the significance of controlling the air pollution to maintain its ambient quality norms TLO 4.5 Compare the noise level from different zones of city with justification TLO 4.6 Describe the roles and responsibilities of central and state pollution control board	<ul> <li>Unit - IV Environmental Pollution</li> <li>4.1 Definition of pollution, types- Natural &amp; Artificial (Man- made)</li> <li>4.2 Soil / Land Pollution – Need of preservation of soil resource, Causes and effects on environment and lives, preventive measures, Soil conservation</li> <li>4.3 Water Pollution - sources of water pollution, effects on environment and lives, preventive measures, BIS water quality standards for domestic potable water, water conservation</li> <li>4.4 Air pollution - Causes, effects, prevention, CPCB norms of ambient air quality in residential area</li> <li>4.5 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city</li> <li>4.6 Pollution Control Boards at Central and State Government level: Norms, Roles and Responsibilities</li> </ul>	Lecture Using Chalk-Board Presentations		
5	TLO 5.1 Explain Constitutional provisions related to environmental protection TLO 5.2 Explain importance of public participation (PPP) in enacting the relevant laws TLO 5.3 Use the relevant green technologies to provide sustainable solutions of an environmental problem TLO 5.4 Explain the role of information technology in environment protection	Unit - V Enviornmental legislation and sustainable practices 5.1 Article (48-A) and (51-A (g)) of Indian Constitution regarding environment, Environmental protection and prevention acts 5.2 Public awareness about environment. Need of public awareness and individuals' participation. Role of NGOs 5.3 Green technologies like solar desalination, green architecture, vertical farming and hydroponics, electric vehicles, plant-based packaging 5.4 Role of information technology in environment protection and human health	Lecture Using Chalk-Board Presentations Video Demonstrations		

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

## VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

#### Assignment

Suggest the steps to implement (or improve the implementation) of the 5R policy in your home/institute stating your contribution

Draft an article on India's Strategies to progress across the Sustainable Development Goals Make a chart of Renewable and non-renewable energy sources mentioning the advantages and disadvantages of each

## ENVIRONMENTAL EDUCATION AND SUSTAINABILITY

#### source

Conduct the SWOT analysis of biodiversity hotspot in India

Prepare a mind-mapping for the zero carbon footprint process of your field

Prepare a chart showing sources of pollution (air/water/ soil), its effect on human beings, and remedial actions Any other assignment on relevant topic related to the course suggested by the facilitator

## **UNICEF** Certification(s)

• Students may complete the self-paced course launched by Youth Leadership for climate Exchange under UNICEF program on portal www.mahayouthnet.in . The course encompasses five Modules in the form of Units as given below:

Unit 1: Living with climate change

Unit 2 : Water Management and Climate Action

Unit 3: Energy Management and Climate Action

Unit 4 : Waste Management and Climate Action

Unit 5 : Bio-cultural Diversity and Climate Action

If students complete all the five Units they are not required to undertake any other assignment /Microproject/activities specified in the course. These units will suffice to their evaluations under SLA component

## Micro project

#### •

Technical analysis of nearby commercial RO plant.

Comparative study of different filters used in Household water filtration unit

Evaluate any nearby biogas plant / vermicomposting plant or any such composting unit on the basis of sustainability and cost-benefit

IKS-Study and prepare a note on Vedic and Pre-Vedic techniques of environmental conversion

Visit a local polluted water source and make a report mentioning causes of pollution

Any other activity / relevant topic related to the course suggested by the facilitator

## Activities

#### •

Prepare a report on the working and functions of the PUC Center machines and its relavance in pollution control. Prepare and analyse a case study on any polluted city of India

Prepare a note based on the field visit to the solid waste management department of the municipal corporation / local authority

Record the biodiversity of your institute/garden in your city mentioning types of vegetation and their numbers Visit any functional hall/cultural hall /community hall to study the disposal techniques of kitchen waste and prepare a report suggesting sustainable waste management tool

Watch a video related to air pollution in India and present the summary

Any other assignment on relevant topic related to the course suggested by the facilitator

#### Course Code : 314301

#### ENVIRONMENTAL EDUCATION AND SUSTAINABILITY

#### Course Code : 314301

#### Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

## VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Nil	All

## IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Sr.No Unit Unit Title		Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1 I Environment and climate change			CO1	8	4	4	4	12
2	II	Sustainability and Renewable Resources	CO2	10	4	4	8	16
3 III Ecosystem and Biodiversity			CO3	8	4	4	4	12
4	IV	Environmental Pollution	CO4	12	4	8	6	18
5	V	Enviornmental legislation and sustainable practices	CO5	7	4	4	4	12
		Grand Total		45	20	24	26	70

### X. ASSESSMENT METHODOLOGIES/TOOLS

#### Formative assessment (Assessment for Learning)

• Two-unit tests (MCQs) of 30 marks will be conducted and average of two-unit tests considered. Formative assessment of self learning of 25 marks should be assessed based on self learning activity such as UNICEF Certification(s)/Microproject/assignment/activities. (60 % weightage to process and 40 % to product)

## Summative Assessment (Assessment of Learning)

• Online MCQ type Exam

## XI. SUGGESTED COS - POS MATRIX FORM

ENVIRON	MENTAL	EDUCAT	TION AND SU	STAINABII	LITY		Course	Code	:314	<b>301</b>
	1	-/	Progra	amme Outco	mes (POs)			Pro S Ou	ogram pecifi itcomo PSOs	ime c es* )
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1		1	-	-	3	2	3			
CO2		2	2	-	3	2	3	2		
CO3		-	-	-	3	1	2		<b>4</b> 8	
CO4	1	-	-	-	3	2	2	í.		
CO5	1		2	-	3	2	3			
Legends : *PSOs are	- High:03, M e to be formu	fedium:02 ulated at i	2,Low:01, No l nstitute level	Mapping: -						

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Y. K. Singh	Environmental Science	New Age International Publishers, 2006, ISBN: 81- 224-2330-2
2	Erach Bharucha	Environmental Studies	University Grants Commission, New Delhi
3	Rajagopalan R.	Environmental Studies: From Crisis to Cure.	Oxford University Press, USA, ISBN: 9780199459759, 0199459754
4	Shashi Chawla	A text book of Environmental Science	Tata Mc Graw-Hill New Delhi
5	Arvind Kumar	A Text Book of Enviornmental science	APH Publishing New Delhi (ISBN 978-8176485906)

## XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://sdgs.un.org/goals	United Nation's website mentioning Sustainability goals
2	http://www.greenbeltmovement.org/news-and-events/blog	Green Belt Movement Blogs on various climatic changes and other issues
3	http://www.greenbeltmovement.org/what-we-do/tree-planting- fo r-watersheds	Green Belt Movement's work on tree plantation, soil conservation and watershed management techniques
4	https://www.youtube.com/@ierekcompany/videos	International Experts For Research Enrichment and Knowledge Exchange – IEREK's platform to exchange the knowledge in fields such as architecture, urban planning, sustainability
5	www.mahayouthnet.in	UNICEF Intiative for youth leadership for climate action

NVIRONMENTAL EDUCATION AND SUSTAINABILITY
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ENVI	RONMENTAL EDUCATION AND SUSTAINABILITY	Course Code : 314301		
Sr.No	Link / Portal	Description		
6	https://eepmoefcc.nic.in/index1.aspx? lsid=297&lev=2&lid=1180 &langid=1	GOI Website for public awareness on enviornmetal issues		
7	https://egyankosh.ac.in/handle/123456789/61136	IGNOU's Intiative for online study material on Enviornmental studies		
8	https://egyankosh.ac.in/handle/123456789/50898	IGNOU's Intiative for online study material on sustainability		
9	https://sustainabledevelopment.un.org/content/documents/1180 3Official-List-of-Proposed-SDG-Indicators.pdf	Final list of proposed Sustainable Development Goal indicators		
10	https://sustainabledevelopment.un.org/memberstates/india	India's Strategies to progress across the SDGs.		
11	https://www.un.org/en/development/desa/financial-crisis/sust ainable-development.html	Challenges to Sustainable Development		
12	https://nptel.ac.in/courses/109105190	NPTEL course on sustainable development		
13	https://onlinecourses.swayam2.ac.in/cec19_bt03/preview	Swayam Course on Enviornmetal studies (Natural Resources, Biodiversity and other topics)		
14	https://onlinecourses.nptel.ac.in/noc23_hs155/preview	NPTEL course on enviornmental studies which encomopasses SDGs, Pollution, Cliamate issues, Energy, Policies and legal framework		
15	https://www.cbd.int/development/meetings/egmbped/SWOT- analys is-en.pdf	SWOT analysis of Biodiversity		
16	https://www.sanskrit.nic.in/SVimarsha/V2/c17.pdf	Central sanskrkit university publication on Vedic and pre vedic enviornmetal conservation		
Note				

Teachers are requested to check the creative common license status/financial implications of the suggested • online educational resources before use by the students

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HYDRAULICS	Course Code : 314303
Programme Name/s	: Agricultural Engineering/ Civil Engineering/ Civil & Rural Engineering/ Construction Technology/ Civil & Environmental Engineering
Programme Code	: AL/ CE/ CR/ CS/ LE
Semester	: Fourth
<b>Course Title</b>	: HYDRAULICS
<b>Course Code</b>	: 314303

#### I. RATIONALE

Hydraulics is a course of civil engineering which consists of study of fluid behavior and design of hydraulic structures. The study of hydraulics plays a important role in various civil engineering applications such as water supply, wastewater management, drainage systems and hydraulic structures. Understanding hydraulics for civil engineers will help them to make decisions during design of hydraulic structures and ensuring the efficient management of water supply and wastewater sources. In this course, student will learn behavior of fluid at rest, fluid in motion, flow through open channel and flow through pipe.

## II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

• Apply the principles of hydraulics in given situation to solve the civil engineering problem.

## **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Interpret the pressure parameters obtained from pressure measuring devices in liquids.
- CO2 Determine total hydrostatic pressure and center of pressure for different conditions.
- CO3 Calculate relevant parameters for given fluid flow.
- CO4 Determine loss of head for flow through pipe in given situation.
- CO5 Find the relevant fluid flow parameters in open channels.

## IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				L	ear	ning	Sche	eme			_		Α	ssess	ment	Sch	eme	1			
Course Code	Course Title	Abbr	Course Category/s	A Co Hrs CL	ctu onta s./W	al ict 'eek LL	SLH	NLH	Credits	Paper Duration	FA- TH	The SA- TH	eory To	tal	Ba FA-	sed o T Prac PR	on LL L ctical SA-	& PR	Base S SI	d on L .A	Total Marks
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314303	HYDRAULICS	HYD	DSC	4	-	2	2	8	4 .	3	30	70	100	40	25	10	25@	10	25	10	175

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## HYDRAULICS

#### Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

- 1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- 2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
- 3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
- 4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
- 5. 1 credit is equivalent to 30 Notional hrs.
- 6. \* Self learning hours shall not be reflected in the Time Table.
- 7. \* Self learning includes micro project / assignment / other activities.

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	<ul> <li>TLO 1.1 Describe the role of hydraulics in the given civil engineering application.</li> <li>TLO 1.2 Compute different properties of liquid from given data.</li> <li>TLO 1.3 Convert gauge pressure into absolute pressure for the given data and vice-versa.</li> <li>TLO 1.4 Compute pressure at a point and pressure difference between two points for the given data using appropriate device.</li> </ul>	<ul> <li>Unit - I Pressure Measurement</li> <li>1.1 Technical terms used: Fluid, Fluid Mechanics, Hydraulics, Hydrostatics, and hydrodynamics-Ideal and Real Fluid, Application of hydraulics in Civil Engineering field.</li> <li>1.2 Physical properties of fluid : Mass Density, Weight Density, Specific Volume, Specific Gravity, Surface Tension of Water, Capillarity of Water, Viscosity, Units of Viscosity, Kinematic Viscosity, Newton's law of Viscosity.</li> <li>1.3 Various types of pressure: Fluid Pressure, Pressure Head, Pasacl's Law and its applications, Absolute Pressure, Gauge Pressure, Atmospheric Pressure, Vacuum Pressure.</li> <li>1.4 Pressure Measuring Devices: Piezometer, Simple U tube Manometer, U Tube Differential Manometer and Inverted U Tube Differential Manometer, Bourdon Tube Pressure Gauge.</li> </ul>	Model Demonstration Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Hands-on Site/Industry Visit Case Study
2	TLO 2.1 Determine the variation of pressure with depth for the given fluid. TLO 2.2 Find Total Pressure and Centre of Pressure for given immersed surface. TLO 2.3 Calculate the resultant pressure and its position using pressure diagram.	<ul> <li>Unit - II Hydrostatics</li> <li>2.1 Definition of Hydrostatics, Total Pressure and Centre of Pressure :Concept and Applications.</li> <li>2.2 Total Hydrostatic Pressure and Center of Pressure :on:Horizontally, Vertically Immersed Surfaces: for rectangular, Triangular and Circular lamina.</li> <li>2.3 Total Pressure and Center of Pressure using Pressure diagram on sides , bottom and partition wall of a tank .</li> </ul>	Model Demonstration Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Hands-on

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HYDR	RAULICS		rse Code : 514505
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Identify the type of flow using the concept of Reynold Number. TLO 3.2 Calculate discharge and velocity in the given situation using Continuity Equation. TLO 3.3 Calculate Total Energy of the given fluid flow. TLO 3.4 Apply Bernoulli's Theorem in the given situation to calculate losses and direction of flow.	<ul> <li>Unit - III Hydro kinematics and Hydro dynamics</li> <li>3.1 Types of Fluid Flow: Steady, unsteady, uniform, non uniform, laminar, turbulent, compressible and incompressible flow, Reynold's number.</li> <li>3.2 Discharge: Definition, Unit, Continuity Equation.</li> <li>3.3 Energies associated with fluid flow: Potential, Kinetic, Pressure Energy and total energy.</li> <li>3.4 Bernoulli's Equation: Statement, Assumptions, Equation, Practical applications , Modified Bernoulli's Theorem.</li> </ul>	Model Demonstration Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Hands-on
4	TLO 4.1 Apply the Darcy Weisbach equation to calculate the relevant losses in a pipe flow. TLO 4.2 Calculate minor losses from the given data. TLO 4.3 Calculate Discharge of pipe system(in Parallel and in series) and Design equivalent pipe. TLO 4.4 Draw HGL and TEL from the given data. TLO 4.5 Calculate discharge in a pipe for the given data using venturimeter. TLO 4.6 Calculate coefficients of Orifice Cd, Cc, Cv for given data TLO 4.7 Suggest the type of pump for given situation. TLO 4.8 Describe the working of the centrifugal pump with sketch. TLO 4.9 Describe the different types of heads associated with Centrifugal pump. TLO 4.10 Compute the power required for Centrifugal pump from the given data.	<ul> <li>Unit - IV Flow through Pipes And Pumps</li> <li>4.1 Major head loss in pipe: Frictional loss and its computation by Darcy Weisbach equation. (Simple Numericals on Darcy Weisbach equation)</li> <li>4.2 Minor Energy (Head) losses in pipe: Sudden Enlargement, Sudden Contraction, loss of head at entrance of pipe, loss of head at exit of pipe, loss of head due to bend in pipes and fittings.</li> <li>4.3 Flow through pipes in series, pipes in parallel and Dupit's equation for equivalent pipe.</li> <li>4.4 Hydraulic Gradient Line and Total Energy Line(No Numerical, only representative Diagram).</li> <li>4.5 Discharge measuring device for pipe flow: Venturimeter, Construction and working.</li> <li>4.6 Discharge measuring for a tank: using Orifice, Hydraulic Coefficients of Orifice.</li> <li>4.7 Pump: Types of pump :Centrifugal, Reciprocating pumps and Submersible pumps.</li> <li>4.8 Centrifugal pump: Component parts and working.</li> <li>4.9 Types of heads :Suction head, delivery head, static head and Manometric head.</li> <li>4.10 Compute power requirement of Centrifugal Pump.</li> </ul>	Model Demonstration Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Hands-on Site/Industry Visit

HYDF	RAULICS	Cou	rse Code : 314303			
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	heory Learning Outcomes (TLO's)aligned to CO's. Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.				
5	TLO 5.1 Describe the geometrical properties of the given Channel. TLO 5.2 Determine discharge in the given channel using relevant formulae for the given data. TLO 5.3 Design the most economical channel section for the given conditions. TLO 5.4 Describe the procedure of finding velocity and discharge using the given flow measuring device. TLO 5.5 Measure the velocity of flow through open channel for the given condition.	<ul> <li>Unit - V Flow through Open Channel</li> <li>5.1 Geometrical properties of Channel section: Wetted area, Wetted perimeter, Hydraulic Radius for Rectangular and Trapezoidal Channel section.</li> <li>5.2 Determination of discharge by Chezy's equation and Manning's equation.</li> <li>5.3 Conditions for most economical rectangular and trapezoidal channel section.</li> <li>5.4 Discharge Measuring Devices: 'V' Notches and Rectangular Notches.</li> <li>5.5 Velocity measurement devices: Floats, Pitot tube.</li> </ul>	Model Demonstration Video Demonstrations Demonstration Presentations Lecture Using Chalk-Board Hands-on Site/Industry Visit			

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Determine physical parameters of given sample of tap water and muddy water.	1	*Computation of physical properties of given fluid (tap water and muddy water).	2	CO1
LLO 2.1 Determine the physical properties of given sample of oil and Mercury.	2	Computation of physical properties of given liquid (oil and Mercury).	2	CO1
LLO 3.1 Measure the pressure at a given point using Bourdon Gauge.	3	Use of Bourdon Gauge to measure the pressure at a given point.	2	CO1
LLO 4.1 Measure the pressure difference between two given points using U tube differential manometer.	4	*Use of U tube differential manometer to measure the pressure difference between two given points.	2	CO1
LLO 5.1 Calculate the resultant pressure and its position for given situation of liquid in a tank.	5	*Find the resultant pressure and its position for given situation of liquid in a tank.	2	CO2
LLO 6.1 Interpret type of flow based on computed value of Reynold's number.	6	Use of Reynold's apparatus to determine type of flow.	2	CO3
LLO 7.1 Apply Bernoulli's theorem the given situation to obtain Total Energy Line.	7	*Use of Bernoulli's apparatus to obtain Total Energy Line for flow in closed conduit of varying cross sections.	2	CO3
LLO 8.1 Determine friction factor for the given pipe using Friction factor Apparatus.	8	*Use of Friction factor Apparatus to determine the friction factor for the given pipe.	2	CO4
LLO 9.1 Determine minor losses in pipe fittings (sudden contraction and Sudden enlargement).	• • 9 •	*Determination of minor losses in pipe for sudden contraction and sudden enlargement.	2	CO4
LLO 10.1 Calculate minor losses in pipe fitting (Bend and Elbow).	10	Determination of minor losses in pipe fitting such as Bend and Elbow.	2	CO4

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HYDRAULICS		0	Course Cod	e : 314303
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Determine the Coefficient of discharge for the given venturimeter fitted in pipe section.	11	*Calibration of Venturimeter to find out the discharge in a pipe.	2	CO4
LLO 12.1 Calculate Cd, Cc and Cv for given type of Orifice.	12	Calibration of Orifice to find out the discharge through a tank.	2	CO4
LLO 13.1 Calculate the efficiency of given Centrifugal Pump.	13	*Determination of efficiency of given Centrifugal Pump.	2	CO4
LLO 14.1 Determine the Coefficient of discharge for given 'V' notch fitted to open channel.	14	*Use of 'V' notch to measure the discharge through open channel.	2	CO5
LLO 15.1 Determine the Coefficient of discharge for flow through open channel using rectangular notch.	15	Use of rectangular notch to measure the discharge through open channel.	2	CO5
Note : Out of above suggestive LLOs -			1	

- '\*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

## VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

## Micro project

• Collect the technical brochure of available brands of pump in the market and prepare report with your comments. Determination of type and capacity of pump for residential bungalow (06 Occupants) of G+1 Storey having 200 Sq m built up area.

Prepare a model of rectangular and trapezoidal channel.

## Assignment

• State and explain causes and remedial measures of water hammer.

Explain the necessity of hydraulic jump.

Explain with neat sketch working of single acting and double acting reciprocating pump. Explain critical, sub critical and supercritical flow with reference to Froude's number.

#### Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

## HYDRAULICS

## VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	<b>Relevant LLO Number</b>
1	Measuring cylinder, Weighing balance	1,2
2	Pipe setup, bend, elbow fittings, stop watch	10
3	Pipe set up fitted with Venturimeter, U tube differential manometer, Stop watch	11
4	Centrifugal pump set up	13
5	Channel set up with different notches, Stop watch	14,15
6	U tube differential manometer, Mercury	2,4
7	Bourdon tube pressure gauge	3
8	Reynold's apparatus, colour dye, Stop watch	6
9	Bernoulli's apparatus, Stop watch	7
10	Friction factor Apparatus, Stop watch	8
11	Apparatus for finding minor losses in the pipe, Stop watch	9

# IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	Ι	Pressure Measurement	CO1	12	2	8	4	14
2	II	Hydrostatics	CO2	12	2	8	4	14
3	III	Hydro kinematics and Hydro dynamics	CO3	10	2	4	6	12
4	IV	Flow through Pipes And Pumps	CO4	16	4	10	6	20
5	V	Flow through Open Channel	CO5	10	4	0	6	10
		Grand Total	60	14	30	26	70	

## X. ASSESSMENT METHODOLOGIES/TOOLS

#### Formative assessment (Assessment for Learning)

• Term work ,Assignment, Microproject (60% Weightage to process and 40% weightage to product),Question and Answer

## Summative Assessment (Assessment of Learning)

• Pen and PaperTest (WrittenTest), Practical Exam, Oral Exam

## XI. SUGGESTED COS - POS MATRIX FORM



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HYDRAU	HYDRAULICS   Course Code : 314303											
	Programme Outcomes (POs)								Programme Specific Outcomes* (PSOs)			
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3		
CO1	2	. 3	3	2	-3	2	2					
CO2	2	2	3	2	2	2	2					
CO3	2	2	3	3	2	2	2					
CO4	2	2	2	2	2	2	2					
CO5	2	3	2	1	2	2	2					
Legends : *PSOs ar	- High:03, N	/ledium:02	2,Low:01, No nstitute level	Mapping: -								

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title —	Publisher with ISBN Number
1	Modi, P. N. and Seth, S.M.	Hydraulics and Fluid Mechanics	Standard book house, Delhi ISBN:13: 978-8189401269;
2	Ramamrutham S, and Narayan, R.	Hydraulics, Fluid Mechanics and Fluid Machines	Dhanpat Rai Publishing Company, New Delhi, ISBN:8187433841
3	Khurmi, R S	Hydraulics, Fluid Mechanics, Hydraulic machines	S Chand Publishers, New Delhi ISBN: 9788121901628
4	Rajput, R K	Fluid Mechanics	S Chand, New Delhi ISBN: 9788121916677
5	Dr. R.K. Bansal	Fluid mechanics and hydraulic machines	Laxmi Publication; New Delhi, ISBN: 978- 8131808153
			and the second se

## XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://eerc03-iiith.vlabs.ac.in/	An MoE, Govt of India virtual laboratory of Hydraulics and Fluid Mechanics.
2	https://nptel.ac.in/courses/105105203	Basics of Fluid Mechanics
3	https://archive.nptel.ac.in/courses/105/106/105106114/	Classification of flow
4	https://nptel.ac.in/courses/105103021	Open Channel flow
5	http://www.nitttrc.edu.in/nptel/courses/video/105101082/L01. html	Fluid Properties
6	https://onlinecourses.nptel.ac.in/noc24_ce20/preview	Hydraulic Jump
7	http://www.nitttrc.edu.in/nptel/courses/video/105103021/L01. html	Advanced Hydraulics
8	https://www.youtube.com/watch? v=mIF7nQBbaj0&list=UU_JX7j7HY XROO6jCAUmHIw&index=231	Fluid Pressure
9	https://www.youtube.com/watch?v=-jb5A9GIuNQ	Energy Gradient of pipe flow

HYDR	AULICS	Course Code : 314303								
Sr.No	Link / Portal	Description								
10	https://www.youtube.com/watch?v=qie6UCJqM_Q	Bernoulli's Equation								
11	https://www.youtube.com/watch?v=PH75Y1wIubQ	Hydraulic Pumps								
Note • 7	: Teachers are requested to check the creative common license status/f online educational resources before use by the students	nancial implications of the suggested								

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RAILWAY, BRIDGE A	AND TUNNEL ENGINEERING	Course Code : 314312
Programme Name/s	: Civil Engineering/ Civil & Rural Engineering/ Construction Environmental Engineering/	Technology/ Civil &
Programme Code	: CE/ CR/ CS/ LE	
Semester	: Fourth	
<b>Course Title</b>	: RAILWAY, BRIDGE AND TUNNEL ENGINEERING	
<b>Course Code</b>	: 314312	

#### I. RATIONALE

Railway, Bridge and Tunnel Engineering is an important aspect of Civil Engineering as they are very crucial in shortening the distance of travel. Efficient and Effective network of different modes of transportation plays an important role in the Nation's economic progress and its integration. The basic requirements of efficient transportation are speed, safety and comfort. This course is intended to develop the basic skills related to investigation, surveys, alignment, construction and maintenance of Railway, Bridge, and Tunnels.

## II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Execute the construction and maintenance of railways, bridges and tunnels.

#### **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Identify the relevant components of Railway Tracks.
- CO2 Maintain the given Railway Track.
- CO3 Maintain the given type of bridge through due inspection.
- CO4 Suggest the relevant method of constructing a tunnel in the given strata.
- CO5 Supervise the construction of tunnels including maintenance activities.

## IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				L	ear	ning	g Sche	eme					Α	ssess	ment	Sch	eme				
Course Code	Course Title	Abbr	Course Category/s	Actual Contact Hrs./Week		SLHNLH		Credits	Paper	Theory			Based on LL & TL Practical		&	Based on SL		Total			
				CL	TL	LĻ			•	Duration	FA- TH	SA- TH	То	tal	FA	PR	SA-	PR	SL	A	19121 85
			1.11						1.1		Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314312	RAILWAY, BRIDGE AND TUNNEL ENGINEERING	RBT	DSC	4	-		2	6	3	3	30	70	100	40		-	-		25	10	125

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## **RAILWAY, BRIDGE AND TUNNEL ENGINEERING**

Course Code : 314312

## Total IKS Hrs for Sem. : 3 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

- 1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- 2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
- 3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
- 4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
- 5. 1 credit is equivalent to 30 Notional hrs.
- 6. \* Self learning hours shall not be reflected in the Time Table.
- 7. \* Self learning includes micro project / assignment / other activities.

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Describe the development of Indian railways till date. TLO 1.2 Show the components of railway track in the given cross section of track. TLO 1.3 Suggest the types of sleepers provided for the specified railway track with justification. TLO 1.4 Propose the relevant type of ballast to be provided in specified railway track with justification. TLO 1.5 Identify the fixtures with fastening provided in the given rail section.	<ul> <li>Unit - I Introduction to Railway Engineering</li> <li>1.1 History of development of railways in India (IKS)</li> <li>,Railway: Zones of Indian railways, Merits and demerits of roadway and railway, Introduction to Metro and Mono rail, Bullet Train.</li> <li>1.2 Components of railway track: Rails , ideal requirements of railway track , types of Rails ,Rail Gauge- types, factors affecting selection of a gauge.</li> <li>titing of rails and coning of wheels. Rail Joints : Necessity, types, requirements of welded joints. Creep of rail: Definition, causes and prevention of creep.</li> <li>1.3 Sleepers : Requirement, functions and types, sleeper density</li> <li>1.4 Ballast : requirement, function, types, suitability.</li> <li>1.5 Rail fixtures and fastenings: fish plate, spikes, bolts, keys, bearing plates, chairs , types of anchors and anticreepers.</li> </ul>	Model Demonstration Video Demonstrations Lecture Using Chalk-Board Site/Industry Visit Case Study

Course Code : 314312

RAILWAY, BRIDGE AND	TUNNEL ENG	INEERING

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Fix the alignment of given railway track laid on typical terrain. TLO 2.2 Draw the cross section of the track showing its geometric elements with neat labels. TLO 2.3 Explain the track geometric components with its importance in its design. TLO 2.4 Explain with sketches the concept of turn outs, points, and crossings w.r.t railway track. TLO 2.5 Propose the relevant type of station with its salient parameters considered in its site selection. TLO 2.6 Justify the necessity of station yard in railway engineering. TLO 2.7 Maintain the track in the capacity of the nermanent way inspector	<ul> <li>Unit - II Track Geometrics</li> <li>2.1 Alignment: Factors governing rail alignment.</li> <li>2.2 Cross sections of Track : Important technical termspermanent land width/right of way, formation width, side slopes, side drains. Standard cross section of single and double line in cutting and in embankment.</li> <li>2.3 Railway Track Geometrics: types and factors affecting Gradient , curves , grade compensation , super elevation-limits of Super elevation on curves , cant deficiency (No numerical in question-paper).</li> <li>2.4 Branching of Tracks: Points and crossings: Turn outleft and right-hand turnout, components, and their functions ,important technical terms ,track junctions-crossovers, scissor cross over, diamond crossing, track triangle.</li> <li>2.5 Railway Station : Purpose , requirement of railway station , factors affecting site selection for railway station, important technical terms , types of railway station.</li> <li>2.6 Station yard: Function , Classification- Passenger, goods, locomotive and marshalling yards, drawbacks of marshalling yards.</li> <li>2.7 Track Maintenance: Necessity , Classification , Tools required for track maintenance with their function , Organization of track maintenance , Duties of permanent way inspector gang mate and key man</li> </ul>	Model Demonstration Video Demonstrations Case Study Presentations Lecture Using Chalk-Board Site/Industry Visit

RAIL	WAY, BRIDGE AND TUNN	EL ENGINEERING Cou	rse Code : 314312
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Elaborate the typical features of major important bridges in India. TLO 3.2 Suggest the relevant type of bridge based on available data. TLO 3.3 Explain Factors affecting Site selection of given type of bridge. TLO 3.4 Explain with sketch Important technical terms related to a bridge. TLO 3.5 Explain with neat sketches the given component of bridge. TLO 3.6 Suggest the relevant type of bridge to be used in the given situation. TLO 3.7 Undertake the inspection of bridge during Pre and post monsoon period. TLO 3.8 Maintain the given type of bridge.	<ul> <li>Unit - III Bridge Engineering</li> <li>3.1 History of development of bridges in India (IKS)</li> <li>3.2 Classification of bridges: according to span, purpose, material, life, alignment, H.F.L, Loading, level of bridge floor.</li> <li>3.3 Site selection and investigation Factors affecting and controlling: Site For Bridge, Bridge Alignment.</li> <li>3.4 Important technical terms: Waterway, Economic Span, Afflux ,Scouring , Erosion, Freeboard , Cut Water ,Ease Water,Apron</li> <li>3.5 Component parts of bridge: Function, requirement, and types- Pier , Abutment , Wing Wall , Foundation ,Bearing</li> <li>3.6 Types of Bridges: Causeway: Flush, low level, and high-level causeway. RCC Bridges , Pre-stressed bridge: Advantage &amp; dis-advantages, Culvert: Types- Arch, Open or slab, Pipe and box</li> <li>3.7 Inspection of bridges: General points to be observed, Pre and post monsoon inspection.</li> <li>3.8 Maintenance of bridges: types - routine and special Maintenance.</li> </ul>	Model Demonstration Video Demonstrations Case Study Presentations Lecture Using Chalk-Board Site/Industry Visit
4	TLO 4.1 Summarize the typical features of major important tunnels in India. TLO 4.2 Identify the type of the tunnel from the given sketch. TLO 4.3 Explain the criteria for selection of the tunnel for given situation with justification. TLO 4.4 Describe the process of shifting the alignment inside the tunnel through shaft. TLO 4.5 Suggest the relevant method of constructing the tunnel in the given terrain.	<ul> <li>Unit - IV Tunnel Engineering</li> <li>4.1 History of development of tunnels in India (IKS).</li> <li>4.2 Classification of tunnels: according to purpose, conveyance, strata through which tunnel passing, alignment, shape, and size of tunnels.</li> <li>4.3 Tunnels: Tunnel investigations and surveying, Cross sections for highways and railways.</li> <li>4.4 Tunnel Shaft : its purpose and construction.</li> <li>4.5 Methods of tunnelling in soft rock: Needle Beam method, Fore-Poling method, Line Plate method, Shield method.</li> </ul>	Model Demonstration Video Demonstrations Case Study Presentations Lecture Using Chalk-Board Site/Industry Visit

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## RAILWAY, BRIDGE AND TUNNEL ENGINEERING

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
5	TLO 5.1 Suggest the relevant method of constructing the tunnel in the available ground strata. TLO 5.2 Select the relevant type of drilling machine for the given strata. TLO 5.3 Describe the process of lining in the given tunnel in the given situation with justification. TLO 5.4 Justify the need to provide the provision for ventilation and drainage in the tunnel. TLO 5.5 Describe the procedure of maintenance of the given tunnel.	<ul> <li>Unit - V Construction and Maintenance of Tunnels</li> <li>5.1 Methods of Tunnelling in Hard Rock: Full-face method, Heading and bench method, drift method, New Austrian Tunnelling Method (NATM).</li> <li>5.2 Drilling Equipment: TBM Tunnel Boring Machine, drills and drills carrying equipment's, Types of explosives used in tunnelling.</li> <li>5.3 Tunnel Lining: Purpose, factors affecting type of lining, and methods.</li> <li>5.4 Tunnel Ventilation and Drainage: Purpose and methods.</li> <li>5.5 Tunnel Maintenance: Purpose and Methods.</li> </ul>	Model Demonstration Video Demonstrations Case Study Presentations Lecture Using Chalk-Board Site/Industry Visit

# VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES : NOT APPLICABLE.

## VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

## Micro project

- Prepare report on Railway Zones in India .
- Prepare model of a bridge/Tunnel to demonstrate the relevant concepts.
- Prepare models of different gauges used in railways.
- Collect the details of new technologies of tunnel excavation and prepare the report.
- Collect the information relevant to transportation engineering about ongoing and completed Railway/Bridge/Tunnel projects. (Minimum 3)
- Role of Indian Railway (IR), MSRDC, NHAI and IRC in development and construction of Railways, Tunnels and Bridges.
- Prepare a report on Bullet Train, Mono rail, Metro Rail project.
- Summarize the salient features of relevant IS codes used in this course in the form of a report.

#### Assignment

- Inspect nearby Railway Track /Bridge/Tunnel (any one) to enumerate the defects if any and prepare the report suggesting remedial measures for ensuring its stability.
- Draw the standard cross section of single line and double line railway on embankment and in cutting.
- List the advanced equipment's/machineries and materials required for preparation of subgrade of railway.
- Compile the relevant information on project Atal tunnel/Patalpani Rail tunnel with your own comments.
- Compile the relevant information on project Bandra Worli sea link bridge/Pamban Bridge with your own comments.
- Visit a nearby Bridge site/Tunnel and prepare a detailed photographic report.
- Compile the relevant information on project Mumbai to Ahmadabad Bullet Train with your own comments.

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## **RAILWAY, BRIDGE AND TUNNEL ENGINEERING**

Course Code : 314312

• Prepare a site visit report to the nearby railway station mentioning the details of the type of station, requirements fulfilling the station and any other important findings with required figures and facts.

## Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

## VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer with internet facility	All

## IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	Ι	Introduction to Railway Engineering	CO1	10	4	4	4	12
2	II	Track Geometrics	CO2	18	4	12	6	22
3	III	Bridge Engineering	CO3	14	2	6	6	14
4	IV	Tunnel Engineering	CO4	10	4	4	4	12
5	V	Construction and Maintenance of Tunnels	CO5	8	0	4	6	10
		Grand Total		60	14	30	26	70

## X. ASSESSMENT METHODOLOGIES/TOOLS

#### Formative assessment (Assessment for Learning)

• Under SLA : Assignment, Microproject (60% Weightage to process and 40% weightage to product), Question and Answer

## Summative Assessment (Assessment of Learning)

• Pen and Paper Test (Written Test)

## XI. SUGGESTED COS - POS MATRIX FORM

MSBTE Approval Dt. 21/11/2024

RAILWAY			NNFL FNGI	NFFRING			Course	07-0 Code	· 314?	1:06 PM	
	Programme Outcomes (POs)								ogram pecifi itcom	me c es*	
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO-2	PSO- 3	
CO1	2	·	N	2	2		3				
CO2	3	1	1	2	2	1	3				
CO3	3	2	2	3	2	2	3				
CO4	3	3	3	2	3	2	3				
CO5	3	3	3	3	3	2	3				
Legends : *PSOs ar	Legends :- High:03, Medium:02,Low:01, No Mapping: -										

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number			
1	S. C. Saxena, S.	A Text Book of Railway	Dhanpat Rai Publications (p) LtdNew Delhi			
1	P. Arora	Engineering	ISBN-13:978-8189928834			
2	Dindro S. D.	Elements of Bridge, Tunnel &	Dhanpat Rai Publications (p) LtdNew Delhi			
Z	Dillula S. F.	Railway Engineering	ISBN: 9789383182220, 9383182229			
2 Abuio & Dindi		Roads, Railways, Bridges and	Standard Book House ISBN: 078 81 80/01 33 7			
5	Aliuja & Difui	Tunnels Engineering	Standard Book House ISBN: 978-81-89401-33-7			
1	Raji A K, K K	Transportation Engineering	AICTE New Delbi ISBN 078-81-060576-1-0			
4	Babu	(Theory and Practice)	AICTE New Dellii ISBN 978-81-900370-1-9			
5	N L Arora	Transportation Engineering	New India Publishing House, New Delhi			
6	D. Sminittagan	Harbour, Dock and Tunnel	Charotar Publishing House Pvt. Ltd.ISBN-13 978-			
0	K. SIIIIVasali	Engineering	9385039195			

## XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://indianrailways.gov.in/	Indian Railway Zones (IKS)
2	https://iricen.gov.in/iricen/BooksList.jsp	IRICEN Books on Railway and Bridge Engineering
3	https://nhsrcl.in/en/home	National High Speed Rail Corporation Limited (Bullet Train)
4	https://msrdc.in/Site/Common/ProjectListDetails.aspx?ID=56&M ainId=18	Versova-Bandra Sea Link Project by MSRDC
5	https://marvels.bro.gov.in/AtalTunnel	Atal Tunnel, Rohtang
6	https://archive.nptel.ac.in/courses/105/105/105105216/	Bridge Engineering video lectures by NPTEL
7	https://nptel.ac.in/courses/105107123	Railway Engineering video lectures by NPTEL

RAIL	WAY, BRIDGE AND TUNNEL ENGINEERING	Course Code : 314312
Sr.No	Link / Portal	Description
8	https://mmrda.maharashtra.gov.in/projects/transport/metro-li ne-1/overview	Mumbai Metropolitan Region Development Authority
Note • 7	: Feachers are requested to check the creative common license status online educational resources before use by the students	financial implications of the suggested
MCDT		
MSBT	E Approval Dt. 21/11/2024	Semester - 4, K Scheme

ESTIMATING, COS	Course Code : 314313	
Programme Name/s	: Civil Engineering/ Civil & Rural Engineering/ Const Environmental Engineering/	ruction Technology/ Civil &
Programme Code	: CE/ CR/ CS/ LE	
Semester	: Fourth	
<b>Course Title</b>	: ESTIMATING, COSTING AND VALUATION	
<b>Course Code</b>	: 314313	

#### I. RATIONALE

In the construction of any civil engineering structure, estimating, costing, and valuation are the fundamental processes that provide valuable insights and support to project planning, budgeting, resource allocation, decision-making, contract negotiation, compliance, performance evaluation, and investment analysis. Today being the era of technology, a provision is also required to be made to implement the above mentioned processes through the use of the various software for achieving the speedy determination of quantities with inbuilt accuracy and precision. This course is specifically designed to develop the basic competencies among the learners to discharge their duties in the field with high efficiency and effectiveness to mitigate risks in projects and thereby to achieve the strategic objective.

#### II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Estimate for the given construction materials, labor, and resources required for construction projects accurately.

#### **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Use the relevant modes of measurements for the given item of work.
- CO2 Prepare approximate estimate of a civil engineering works.
- CO3 Prepare detailed estimate of a civil engineering works.
- CO4 Fix the rate for the given item of work using relevant rate analysis technique.
- CO5 Conduct the process of the valuation for the specified purpose.

#### IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				L	ear	ning	g Sche	eme					As	ssess	ment	Sche	eme			4	
Course Code	Course Title	Abbr (	Course Category/s	Actual Contact Hrs./Week		SLH	NLH	Credits	Paper		Theory		Based on LL & TL Practical		&	Based on SL		Total Morika			
				CL TL	LL				Duration	FA- TH	SA- TH	Tot	tal _	FA-	PR	SA-	PR	SL	A.	IVIAI KS	
	1 N	·		÷.,		۰.			1.1.1		Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314313	ESTIMATING, COSTING AND VALUATION	ECV	DSC	4	-	4		8	4	4	30	70	100	40	50	20	25#	10		-	175

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## ESTIMATING, COSTING AND VALUATION

#### Course Code : 314313

## Total IKS Hrs for Sem. : 0 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

- 1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- 2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
- 3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
- 4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
- 5. 1 credit is equivalent to 30 Notional hrs.
- 6. \* Self learning hours shall not be reflected in the Time Table.
- 7. \* Self learning includes micro project / assignment / other activities.

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Justify the importance of an Administrative Approval and Technical Sanction in civil engineering projects. TLO 1.2 Perform the role of an estimator in civil engineering projects TLO 1.3 Write the detailed specifications for the given construction project. TLO 1.4 Undertake the relevant modes of measurement as per IS 1200 TLO 1.5 Apply the rule of deduction for the given construction work as per IS: 1200 TLO 1.6 Use the various formats of measurements and bill of quantities for the given work.	<ul> <li>Unit - I Basics of Estimating and costing</li> <li>1.1 Introduction: Estimating, Types and purpose, costing, Administrative Approval, Technical Sanction and Budget provision.</li> <li>1.2 Roles and responsibility of Estimator.</li> <li>1.3 SSR: Meaning, Purpose, Checklist and Detailed Specification of items of work in load bearing and framed structure as per the Execution.</li> <li>1.4 Modes of measurement and desired accuracy in measurements of different items of work as per IS: 1200.</li> <li>1.5 Rules for deduction in Masonry work, Plastering and Pointing and Painting work as per IS: 1200.</li> <li>1.6 Standard formats of Measurement sheet, Abstract sheet, Face sheet.</li> </ul>	Lecture Using Chalk-Board Presentations Video Demonstrations

#### **ESTIMATING, COSTING AND VALUATION** Course Code: 314313 Suggested **Theory Learning Outcomes** Learning content mapped with Theory Learning Sr.No Learning (TLO's)aligned to CO's. Outcomes (TLO's) and CO's. Pedagogies. TLO 2.1 Specify the purpose **Unit - II Approximate Estimate** of an approximate estimate in 2.1 Approximate estimate: Definition, Purpose, types. the given civil engineering 2.2 Methods of approximate estimate: Service unit project. method, Plinth area rate method, Cubical content Lecture Using TLO 2.2 Use relevant type of method, Typical bay method, Approximate quantity Chalk-Board 2 method to prepare an method. (Numerical on any one method out of Service Presentations approximate estimate unit method, Plinth area rate method, Typical bay Flipped TLO 2.3 Prepare an Classroom method). approximate estimate for the 2.3 Approximate estimate for roads, Railways, given civil engineering bridges/culvert, irrigation projects and water supply structure. projects. **Unit - III Preparation of Detailed Estimate** 3.1 Detailed Estimate: Definition and Purpose, Data TLO 3.1 Explain the procedure of the detailed required for detailed estimate, Procedure of preparation estimate for the given project. of detailed estimate, taking out quantities and TLO 3.2 Classify the detailed Abstracting in prescribed format. estimate based on the purpose 3.2 Types and Uses of detailed Estimates: Revised of civil work. estimate, supplementary estimate, revised and TLO 3.3 Propose the relevant supplementary estimate, repair and maintenance method of detailed estimate estimate. for the given project. 3.3 Methods of Detailed Estimate- a) Unit quantity TLO 3.4 Determine the method and total quantity method. b) Long wall and quantities for given Load Short wall method (out to out and in to in method or Lecture Using bearing structure. PWD method), Centre line method. Chalk-Board TLO 3.5 Calculate the 3.4 Calculate the quantities of the given items for the Presentations given load bearing structure. Video 3 quantities of given component of RCC framed structure. 3.5 Calculate the quantities of the given items for the Demonstrations TLO 3.6 Prepare the bar given RCC framed structure. Site/Industry Visit bending schedule for the given 3.6 Bar bending schedule, Rebar: Meaning, Purposes. Case Study component of RCC project. 3.7 Steel requirement for footing, column, beam, TLO 3.7 Estimate the steel Lintel, chajja and slab, Determination of rebar requirement of given building quantities as per IS 2502:1963. component. 3.8 Provisions in detailed estimate: contingencies, TLO 3.8 Prepare the bill of work charged establishment, centage charges, water quantity for the given civil supply and sanitary Charges and electrification work. charges. TLO 3.9 Calculate the 3.9 Earthwork : Quantities for roads, Bunds and canal by Mid sectional area method, Mean sectional area earthwork quantity for the given civil Engineering work. method, Prismoidal formula method and trapezoidal formula method.

Semester - 4, K Scheme

ESTIN	ESTIMATING, COSTING AND VALUATION Co					
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.			
4	TLO 4.1 Explain the importance of rate analysis in civil engineering. TLO 4.2 Justify the importance of sundry charges in the estimate of the civil work TLO 4.3 Fix the market rate of a given item of work using relevant rate analysis method TLO 4.4 Assign different skilled labor for different items TLO 4.5 Deploy the relevant type of manpower for the specified work. TLO 4.6 Prepare rate analysis for the given items of work.	<ul> <li>Unit - IV Rate Analysis</li> <li>4.1 Rate Analysis: Definition, purpose, importance and factors affecting.</li> <li>4.2 Sundry Expenses: Lead (Standard and Extra), lift, overhead charges, water charges and contractors profit.</li> <li>4.3 Procedure of rate analysis market rate determination etc.</li> <li>4.4 Task work- Definition, factors Affecting, types, Task work of different skilled labor for different items.</li> <li>4.5 Categories of labors, their daily wages, types and number of labors for different items of work.</li> <li>4.6 Preparing rate analysis of different items of work: PCC, RCC work in (column, beam, lintel, slab), brick masonry, stone masonry, Vitrified tile flooring, plastering.</li> </ul>	Lecture Using Chalk-Board Presentations Video Demonstrations Flipped Classroom			
5	TLO 5.1 Explain the purpose of valuation of the given civil structure. TLO 5.2 Differentiate between the terms, "cost, value and price" with their significance in civil engineering. TLO 5.3 Classify the value of the given structure. TLO 5.4 Calculate the depreciation of the cost of the given structure using relevant method of depreciation. TLO 5.5 Compute the capitalized value of the structure based on given data. TLO 5.6 Calculate monthly rent of the given building as per PWD norms. TLO 5.7 Signify the importance of the terms, "Lease and Mortgage".	<ul> <li>Unit - V Valuation</li> <li>5.1 Definition and purpose of Valuation, role of valuer.</li> <li>5.2 Define: Cost, Price and Value, Characteristics of Value, Factors Affecting Value.</li> <li>5.3 Types of Value: Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value.</li> <li>5.4 Depreciation, Obsolescence, Sinking Fund.</li> <li>Methods of Calculation of Depreciation : Straight Line Method, Sinking Fund Method, Constant Percentage Method.</li> <li>5.5 Computation of capitalized value, Gross income, Outgoings, Net Income, Year Purchase, Types of outgoings.</li> <li>5.6 Fixation of rent as per PWD Norms and Practice.</li> <li>5.7 Lease : types of lease, lease hold property and free hold property, Mortgage : Mortgage deed, precautions to be taken while making mortgage.</li> </ul>	Presentations Case Study Site/Industry Visit			

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning		Laboratory Experiment / Practical Titles /	Number	Relevant
Outcome (LLO)	No	<b>Tutorial Titles</b>	of hrs.	COs
LLO 1.1 Prepare the check list of items to			1.1	
be executed with market rates and units for	1	Prepare the checklist of items from given	2	CO1
detailed estimate of the given structure from	1	drawing.	2	COI
the given drawing.				

ESTIMATING, COSTING AND VALUATI	urse Code	: 314313		
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Analyze the SSR of into relevant categories and subcategories of construction activities.	2	*Analysis of SSR for any five item of construction.	2	CO1
LLO 3.1 Prepare the approximate estimate for the given civil engineering works. (service unit method)	3	*Prepare approximate estimate by using service unit method.	2	CO2
LLO 4.1 Prepare the approximate estimate for the given civil engineering works. (Typical bay method)	4	*Prepare approximate estimate by using Typical bay method.	2	CO2
LLO 5.1 Use long wall short wall method to determine the quantity of items of work (Excavetion,PCC,UCR,DPC) using standard measurement sheet for 1BHK load bearing residential Building (Part-I).	5	*Determine the quantities for Excavation, PCC,UCR, DPC of 1BHK load bearing residential building using long wall short wall method. (Part I)	2	CO3
LLO 6.1 Use long wall short wall method to determine the quantity of items of work (Brick Work,Plastering, flooring, slab )using standard measurement sheet for 1BHK load bearing residential Building (Part-II	6	*Determine the quantities for Brick Work, Plastering, flooring, slab of 1BHK load bearing residential building using long wall short wall method. (Part II)	2	CO3
LLO 7.1 Use Center line method to determine the quantity of items of work (Excavetion,PCC,UCR,DPC) using standard measurement sheet for 1BHK load bearing residential Building. (Part-I)	7	Determine the quantities for Excavation, PCC,UCR,DPC of 1BHK load bearing residential building using Center line method (Part I).	2	CO3
LLO 8.1 Use Center line method to determine the quantity of items of work (Brick Work,Plastering, flooring, slab)using standard measurement sheet for 1BHK load bearing residential Building (Part-II)	8	Determine the quantities for Brick Work, Plastering, flooring, slab of 1BHK load bearing residential building using Center line method (Part II).	2	CO3
LLO 9.1 Prepare detailed estimate for RCC (G+1) residential framed structure from the given drawing. (Part-I)	9	*Prepare detailed estimate with abstract for RCC (G+1) residential framed structure. (Part I) (Manual)	2	CO3
LLO 10.1 Prepare detailed estimate for RCC (G+1) residential framed structure from the given drawing. (Part-II)	10	*Prepare detailed estimate with abstract for RCC (G+1) residential framed structure. (Part II) (Manual)	2	CO3
LLO 11.1 Use the relevant open source software to prepare detailed estimate for RCC (G+1) residential framed structure from the given drawing. (Part-I)	11	*Prepare detailed estimate with abstract for RCC (G+1) residential framed structure using relevant available open source Software.(Part-I)	2	CO3
LLO 12.1 Use the relevant open source software to prepare detailed estimate for RCC (G+1) residential framed structure from the given drawing. (Part-II)	12	Prepare detailed estimate with abstract for RCC (G+1) residential framed structure using relevant available open source software.(Part-II)	2	CO3
LLO 13.1 Calculate the reinforcement quantities for footing of a room size for 4 m X 5 m from the given set of drawings.	13	Prepare the bar bending schedule with reinforcement estimate for the footing of given structure.	2	CO3

ESTIMATING, COSTING AND VALUATION Course Code : 314313					
Practical / Tutorial / Laboratory Learning Sr Laboratory Experiment / Practical Titles /				Relevant	
Outcome (LLO)	No	Tutorial Titles	of hrs.	COs	
LLO 14.1 Calculate the reinforcement		*Prepare the bar bending schedule with			
quantities for column of a room size for 4 m	14	reinforcement estimate for the column of	2	CO3	
$\mathbf{X}$ 5 m from the given set of drawing.		given structure.			
LLO 15.1 Calculate the reinforcement		Prepare the bar bending schedule with			
quantities for beam of a room size for 4 m	15	reinforcement estimate for the beam of	2	CO3	
$\dot{X}$ 5 m from the given set of drawing.		given structure.			
LLO 16.1 Calculate the reinforcement		*Prepare the bar bending schedule with			
quantities for slab of a room size for 4 m X	16	reinforcement estimate for the slab of given	2	CO3	
5 m from the given set of drawing.		structure.	1.1		
LLO 17.1 Estimate the steel quantity from		Prepare the bar bending schedule with	1		
the given drawing using IS code 2502-1963	17	reinforcement estimate for rebaring of	2	CO3	
for rebaring of beam structural members.		beam to be extended.			
LLO 18.1 Estimate the steel quantity from		Prepare the bar bending schedule with			
the given drawing using IS code 2502-1963	18	reinforcement estimate for rebaring of	2	CO3	
for rebaring of column structural members.		column to be extended.	11 N		
LLO 19.1 Use the Trapezoidal method to		*Determine the earth work quantity in			
determine the earth work quantity in	19	embankment and cutting using Trapezoidal	2	CO3	
embankment and cutting.		method.			
LLO 20.1 Use the Prismoidal method to	-	Determine the earth quantity in			
determine the earth work quantity in	20	embankment and in cutting using	2	CO3	
embankment and cutting.		Prismoidal method.			
LLO 21.1 Use the mid sectional area		*Determine the earth work quantity in	1		
method to determine the earth work	21	embankment and in cutting using mid	2	CO3	
quantity in embankment and cutting		sectional area method.			
LLO 22.1 Use the mean area method to		Determine the earth work quantity in			
determine the earth work quantity in	22	embankment and cutting using mean area	2	CO3	
embankment and cutting.	-	method.			
LLO 23.1 Use the relevant open source		Prepare the detailed estimate of W.B.M.			
software to prepare detailed estimate of the	23	Road using relevant open source software	2	CO3	
WBM Road. (Part I)		(Part I)			
LLO 24.1 Use the relevant open source		Prepare the detailed estimate of W.B.M.			
software to prepare detailed estimate of the	24	Road using relevant open source software	2	CO3	
WBM Road. (Part II)		(Part II)			
LLO 25.1 Prepare the detailed estimate for	25	Prepare the detailed estimate for small	2	CO3	
small septic tank from given set of drawing.		septic tank			
LLO 26.1 Prepare the rate analysis for the	26	*Prepare the rate analysis for the given five	2	CO3	
given five item of work.		item of work.		_	
LLO 27.1 Carry out survey of different		*Carry out survey and prepare a report	$\mathbf{N} = \mathbf{N}$		
categories of labor it's types, and no of labor		on different Categories and types of	~	004	
for different item of work on site and	21	labor required for completion of	2	CO4	
prepare its report	$\mathbb{R}^{2}$	various items of work on site.			
LLO 29 1 Deserve the share of the state		(visit and compare any three sites).			
LLO 28.1 Prepare the chart reflecting all	20	Create a chart reflecting all values	2	COS	
values pertaining to valuation of residential	28	pertaining to valuation of residential	2	COS	
LLO 20 1 Determine the vielustice of a		ounding with their significance.			
given structure and submits the valuation	20	*Prepare the valuation report for the given	2	COS	
report in prescribed formats	29	building.	4	005	

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ESTIMATING, COSTING AND VALUAT	ION	Co	<b>Course Code : 314313</b>		
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs	
LLO 30.1 Determine the monthly rent of the given area of the building from the given data.	30	*Determine the monthly rent of the given area of building from the given data.	2	CO5	
<ul> <li>Note : Out of above suggestive LLOs -</li> <li>'*' Marked Practicals (LLOs) Are mand</li> <li>Minimum 80% of above list of lab expe</li> <li>Judicial mix of LLOs are to be perform</li> </ul>	ator erim ed to	y. ent are to be performed. o achieve desired outcomes.			

## VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

## Micro project

- Enlist the minimum ten salient provisions made in IS:1200 with special reference to load bearing structure.
- Enlist the minimum ten salient provisions made in IS:1200 with special reference to Framed structure.
- Prepare detailed estimate of minimum one load bearing structure using available open source software.
- Rate analysis by analyzing no of labor required for different items of civil works such as 10 cu. m excavation, cement concrete in foundation, Bricks work, rubble stone masonry works. Etc. and 100 m2 12mm thick plastering, 20 mm thick Damp proof course, cement pointing, white washing etc.
- Collect the rebar reinforcement drawings of minimum one building and interpret the drawings with report.
- Prepare rate analysis of Painting work for OBD, Plastic emulsion, Oil paint, luster paint having minimum 150 m2 area.
- Prepare approximate estimate of minimum one residential building.
- Prepare valuation report of minimum one residential building.
- Workout quantities of cement, sand and bricks for 30 m3,40m3.50m3,60m3 in cement mortar 1:6

## Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

## VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer systems with internet connection	3
2	Available Software of estimating and Costing.	3

## IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

ESTI	MAT	ING, COSTING AND VALUAT		Course Code : 314313					
Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks	
1	Ι	Basics of Estimating and costing	CO1	6	2	4	0	6	
2	II	Approximate Estimate	CO2	8	0	4	4	8	
3	III	Preparation of Detailed Estimate	CO3	24	6	14	10	30	
4	IV	Rate Analysis	CO4	12	4	4	6	14	
5	V	Valuation	CO5	10	2	4	6	12	
		Grand Total		60	14	30	26	70	

## X. ASSESSMENT METHODOLOGIES/TOOLS

## Formative assessment (Assessment for Learning)

• Two-unit tests of 30 marks will be conducted and average of two-unit test considered for formative assessment of exercises writing 50 marks.each exercises will be assessed considering appropriate % weightage to process and product and other instructions of assessments.

## Summative Assessment (Assessment of Learning)

• Term Work, Practical Exam, Oral and Written End semester Exam

## XI. SUGGESTED COS - POS MATRIX FORM

			Progra	amme Outco	mes (POs)			Pro S Ou	gram pecifi tcom PSOs	me c es* )
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	2	1	1	1	1	1	2.			
CO2	2	3	2	1	1	3	3 .			
CO3	3	3	3	3	1	. 3	3		· · / /	
CO4	3	3	2	2	1	3	3			
CO5	3	2	1	3	3	2	3	(-, -)		
Legends : *PSOs are	- High:03, M e to be form	/ledium:02 ulated at i	2,Low:01, No 1 nstitute level	Mapping: -						

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Datta, B.N.	Estimating and Costing in Civil engineering	UBS Publishers Distributors Pvt. Ltd. New Delhi. ISBN:9788174767295

ESTIN	MATING, COST	FING AND VALUATION	Course Code : 314313					
Sr.No	Author	Title	Publisher with ISBN Number					
2	Chakraborti,M.	Estimating and costing, specification and valuation in civil engineering	Monojit Chakraborti, Kolkata (2006) ISBN-10: 818530436X ISBN-13: 978-8185304366					
3	Patil, B.S.	Civil Engineering Contracts and Estimates	Orient Longman, Mumbai, Ed.2010 ISBN: 9788173715594, 8173715599					
4	Rangwala,S.C.	Valuation of Real Properties	Charotar Publishing House Pvt. Limited (2008) ISBN:9788185594774, 8185594775					
5	Birdie,G.S.	Estimating and Costing	Dhanpat Rai Publishing Company(P) Ltd.NewDelhi110002 ISBN : 978-93-84378-13-4					

## XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://mjp.maharashtra.gov.in/schedule-rate-dsr/	Schedule Rate (DSR) Maharashtra Jeevan Pradhikaran
2	https://mjp.maharashtra.gov.in/schedule-rate-dsr/	CPWD in house codes, manuals, schedules, technical specifications, design manuals and technical publications.
3	https://www.microsoft.com/en-in/microsoft-365/excel	Microsoft Excel 365 open source software
4	https://www.youtube.com/watch?v=IoBd5UhGifs	Full Building Estimation in Excel sheet
5	https://youtube.com/playlist? list=PLMCExauCXvoOGL3nP49eeUa tf1PAJ8q&si=N4gNlyNL3PzLvRTx	Estimating, Costing and Valuation
6	https://www.youtube.com/watch?v=iry2zEoPvsU	Sinking Fund / Book Value / Scrap Value / Market Value / Salvage Value / Valuation
7	https://www.youtube.com/watch?v=C6O09yOa45c	Rate Analysis Of Civil Work   How to Prepare Rate Analysis   Rate Analysis for 1000 sqft house plan
8	https://www.youtube.com/watch? v=H5qIwRCOFn4&list=PLv20kpHlal H1zD-oueYjooR-KdO6q_NLa&index=4	Administrative approval, Technical sanction and Budget provision
9	https://www.youtube.com/watch? v=ZAnIaZIMGtw&list=PLv20kpHlal H1zD-oueYjooR-KdO6q_NLa&index=5	Types of estimates - Approximate estimate and Detailed estimate
10	https://www.youtube.com/watch?v=-BRwUs27ByY	Valuation of a Property / What is the purpose of Valuation / What factors affecting Valuation
11	http://acl.digimat.in/nptel/courses/video/124105015/lec40.pd f	Rebar Detailing
Note	•	

• Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

MSBTE Approval Dt. 21/11/2024

WATER AND WAST	Course Code : 314314	
Programme Name/s	: Civil Engineering/ Civil & Rural Engineering/ Co Environmental Engineering/	nstruction Technology/ Civil &
Programme Code	: CE/ CR/ CS/ LE	
Semester	: Fourth	
Course Title	: WATER AND WASTEWATER ENGINEERING	
Course Code	: 314314	

## I. RATIONALE

Urbanization is rapidly increasing, straining resources and infrastructure, and jeopardizing environmental quality. Therefore, it is necessary to ensure safe drinking water, effective waste disposal methods, and a pollution-free environment for maintaining good sustainable public health. A civil engineer is required to develop a basic understanding of the sources, characteristics, purification methods and conveyance system of water supply including the knowledge of domestic sewage disposal and its treatment. This course is intended to develop the basic competencies among the learners about water and wastewater treatments.

## II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Maintain the processes related to water treatment and wastewater treatment.

## **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Interpret the water demand and quality of water.
- CO2 Apply the water purification processes.
- CO3 Select the distribution system and pipe network for water supply.
- CO4 Interpret the plumbing system and sewer appurtenances.
- CO5 Apply the wastewater treatment processes.

## IV. TEACHING-LEARNING & ASSESSMENT SCHEME

		Course Title Abbr Course Title Abbr Course Title Abbr Course SLH N			Learning Scheme						Assessment Scheme										
Course Code	Course Title		NLH	Credits	Paper	Theory		Based on LL & TL Practical			&	Based on SL		Total Morks							
					Duration	FA- TH	SA- TH	То	tal	FA-	PR	SA-	PR	SI	A	1 <b>VIAI KS</b>					
						1	1				Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314314	WATER AND WASTEWATER ENGINEERING	WWE	DSC	4	-	2		6	3	3	30	70	100	40	25	10	-	-	-	-	125

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## WATER AND WASTEWATER ENGINEERING

## Course Code : 314314

### Total IKS Hrs for Sem. : 2 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

- 1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- 2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
- 3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
- 4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
- 5. 1 credit is equivalent to 30 Notional hrs.
- 6. \* Self learning hours shall not be reflected in the Time Table.
- 7. \* Self learning includes micro project / assignment / other activities.

## V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Classify the sources with intake structures of water on the basis of given criteria. TLO 1.2 Determine future population by using relevant forecasting method. TLO 1.3 Undertake the testing of given water sample using relevant method as per IS code.	<ul> <li>Unit - I Sources, Characteristics and Demand of Water</li> <li>1.1 Sources of water: Surface and Subsurface sources of water.</li> <li>Intake Structures: Definition, types and factors governing the location.</li> <li>1.2 Demand of water: Need to protect water supplies, Demand of water: Definition, Types, Factors affecting, rate and variations in water demands. Forecasting of population:</li> <li>Introduction and Methods, (Numerical based on Arithmetical Increase, geometrical decrease &amp; Incremental increase only).</li> <li>Design period, estimating of demand of water supply required for city or town.</li> <li>1.3 Characteristics and testing of water: Need for analysis of water, Physical, Chemical and Biological properties of water.</li> <li>Testing of water for Total solids, hardness, chlorides, Dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E. coli, B. coli index, MPN. Sampling of Water: Single &amp; Grab. Water quality standards as per (I.S. 10500:2012).</li> </ul>	Demonstration Video Demonstrations Lecture Using Chalk-Board

MSBTE Approval Dt. 21/11/2024
## WATER AND WASTEWATER ENGINEERING

WATE	WATER AND WASTEWATER ENGINEERING Cours				
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.		
2	TLO 2.1 Draw the labeled flow diagram of water treatment plant with enough description. TLO 2.2 Justify the process of filtration of water. TLO 2.3 Justify the process of disinfection of water. TLO 2.4 Apply the relevant technique of water softening and de- fluoridation for the given sample of water. TLO 2.5 Apply electrolysis and reverse osmosis technique on the given sample of water for the intended purpose.	<ul> <li>Unit - II Purification of Water</li> <li>2.1 Purification of Water: Flow diagram of water supply scheme, function of units of water supply scheme. Screening - Types, functions and suitability. Aeration - objects and methods of aeration. Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, (IKS*: Alum is placed in clay water pot) Jar Test, process of coagulation, types of sedimentation tanks. Clariflocculator - Principle and working with diagram.</li> <li>2.2 Filtration: Theory of filtration, classification of filters - slow sand filter, rapid sand filter, pressure filter, construction and working of slow sand filter and rapid sand filter.</li> <li>2.3 Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, orthotolidine test.</li> <li>2.4 Water Softening Methods: Need and necessity of Water softening, lime soda process and zeolite process. De- fluoridation techniques.</li> <li>2.5 Advanced Water Treatments: Electrolysis, Reverse Osmosis.</li> </ul>	Demonstration Lecture Using Chalk-Board Collaborative learning Video Demonstrations Site/Industry Visit Case Study		
3	TLO 3.1 Select the relevant mode of conveyance system in the given situation. TLO 3.2 Suggest the water distribution method for the given situation. TLO 3.3 Use the relevant pipe network system for water distribution in the given situation.	<ul> <li>Unit - III Water Distribution System</li> <li>3.1 Conveyance: Pipes - Types, Choice of materials, Joints and valves - Types, location and functions.</li> <li>3.2 Distribution methods: Methods - Gravity, pumping, and combined system, suitability, advantages and disadvantages.</li> <li>(IKS* Harappa and Mohenjo-daro, Katraj lake-Shaniwar wada, Nahr-e-Ambari water course) Service reservoirs - types and functions.</li> <li>3.3 Pipe Network System: Dead end system, grid iron system, circular system, radial system - their suitability, advantages and disadvantages.</li> </ul>	Demonstration Video Demonstrations Lecture Using Chalk-Board Collaborative learning Case Study		

WATI	VATER AND WASTEWATER ENGINEERING Course Code : 314314							
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.					
4	TLO 4.1 Propose the relevant sanitary fittings to be used at the given location of sanitation system. TLO 4.2 Illustrate relevant type of plumbing system for the given situation. TLO 4.3 Justify the relevant type of sewerage system for the given situation. TLO 4.4 Illustrate sewer appurtenances in the given situation.	<ul> <li>Unit - IV Building Sanitation System</li> <li>4.1 Building Sanitation: Necessity of sanitation, Necessity to treat domestic sewage, Definitions: Sewage, sullage, types of sewage, Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe, Building sanitary fittings - Water closet (Indian and European type), flushing cistern, wash basin, sinks, Urinals. Traps: Types, quality and function.</li> <li>4.2 Systems of plumbing: One pipe, two pipe, single stack, choice of system, Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan), Inspection and junction chambers- necessity, location, size and shape, Maintenance of sanitary units such as wash basin, sink, traps and chambers.</li> <li>4.3 Systems of Sewerage: Introduction, Systems of sewerage: Separate, Partially Separated and Combined.</li> <li>4.4 Sewer Appurtenances: Definition, Types of Sewers, Design of sewers, Self cleansing velocity and non scouring velocity, Laying, Testing and maintenance of sewers, Cleaning of municipal sewers before and after monsoon, Manholes and Drop Manhole - component parts, location, spacing, construction details. Sewer Inlets, Street Inlets.</li> </ul>	Lecture Using Chalk-Board Lecture Using Chalk-Board Demonstration Video Demonstrations Site/Industry Visit					
5	TLO 5.1 Evaluate the given characteristics of the sewage sample in relation with MPCB norms. TLO 5.2 Describe the function of various units of sewage treatment plant. TLO 5.3 Describe the construction of septic tank with its working principle. TLO 5.4 Describe the construction of septic tank with its working principle.	<ul> <li>Unit - V Sewage Treatment System</li> <li>5.1 Analysis of sewage: Characteristics of sewage, D.O., B.O.D., C.O.D. and its significance, Aerobic and anaerobic process, Maharashtra Pollution Control Board Norms for the discharge of treated sewage, Purposes of sewage treatment.</li> <li>5.2 Treatment of Sewage: Flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process. Disposal of sewage, Oxidation pond, Oxidation ditch.</li> <li>5.3 Septic tank &amp; soak pit: Principle, Construction, Working and Maintenance.</li> <li>5.4 Recycling and Reuse of domestic wastewater: Necessity, Advantages, Disadvantages, methods and uses.</li> </ul>	Lecture Using Chalk-Board Video Demonstrations Demonstration Site/Industry Visit Collaborative learning Case Study					

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning		Laboratory Experiment / Practical	Number	Relevant
Outcome (LLO)	No	<b>Titles / Tutorial Titles</b>	of hrs.	COs
LLO 1.1 Determine the pH value of the given sample of water.	1	*Determination of pH value of water sample.	2	CO1
LLO 2.1 Determine the turbidity of the given sample of water.	2	*Determination of the turbidity of the sample of water.	2	CO1

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Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs		
LLO 3.1 Use the Whatman filter paper to determine the suspended solids, dissolved solids and total solids of given sample of water.	3	*Determination of suspended solids, dissolved solids and total solids of a water sample.	2	CO1		
LLO 4.1 Use digital TDS meter to determine the TDS (Total Dissolved Solids).	4	Determination of the TDS by using a portable digital TDS meter.	2	CO1		
LLO 5.1 Use mechanical/digital DO meter to find the dissolved oxygen content present in a given sample of water.	5	Determination of the dissolved oxygen in a given sample of water.	2	CO1		
LLO 6.1 Undertake the test to detect the presence of residual chlorine in a given sample of water using orthotolidine testing kit.	6	*Determination of residual chlorine in the sample of water.	2	CO2		
LLO 7.1 Undertake a field visits to water treatment plant.	7	*Preparation of report on field visit to the nearby water treatment plant.	2	CO2		
LLO 8.1 Deploy the jar test method to find the optimum dose of coagulant in the given raw water sample.	8	*Determination of the optimum dose of coagulant in the given raw water sample by jar test.	2	CO2		
LLO 9.1 Write a report on working of water purifier, (RO purifier).	9	Demonstration of water purifier based on its components and working, (RO purifier).	2	CO2		
LLO 10.1 Draw sketches of various joints used in the water supply pipeline.	10	*Illustration of various joints used in water supply pipeline through sketches.	2	CO3		
LLO 11.1 Draw a labeled sketch of the one pipe, two pipe system and layout plan for drainage for a residential building.	11	Preparation of a sketch of one pipe, two pipe system and layout plan for drainage for a residential building.	2	CO4		
LLO 12.1 Calculate BOD of given sample of wastewater.	12	Determination of BOD of a given sample of wastewater.	2	CO5		
LLO 13.1 Calculate the dissolved oxygen content in the given sample of wastewater.	13	*Determination of the dissolved oxygen in the given sample of wastewater.	2	CO5		
LLO 14.1 Calculate COD of a given sample of wastewater.	14	Determination of COD of a given sample of wastewater.	2	CO5		
LLO 15.1 Write a report on wastewater treatment plant.	15	Preparation of a report on a field visit to the wastewater treatment plant.	2	CO5		

### Note : Out of above suggestive LLOs -

- '\*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

# VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

## Micro project

• Present the test results of minimum three water samples obtained from a locally available area to ascertain its characteristics. (pH, Turbidity, D. O., Residual chlorine, Temperature, etc.)

Conduct an internet surfing survey/visit to local statutory water bodies for the quality of water, prepare a report on it

#### WATER AND WASTEWATER ENGINEERING

#### Course Code : 314314

and write your comment.

Present the test results of minimum three wastewater samples obtained from a locally available area to ascertain its characteristics.

Suggest minimum ten remedial measures for the control of pollution of local water sources by conducting relevant studies and tests.

Visit the site where recycling and utilization of treated wastewater is being implemented and prepare a detailed report on it.

Suggest minimum three social and eco-friendly methods to treat sullage water.

Suggest minimum five relevant methods/strategies to save water.

Suggest a treatment given to bore water to make it fit for drinking.

List a minimum of six building sanitary appurtenances used in current practice.

Prepare a presentation with minimum ten slides on the treatment of wastewater.

#### Assignment

• Collect information regarding minimum ten norms for water and wastewater treatment of statutory water bodies.

Prepare a presentation with minimum ten slides on conventional or advanced wastewater treatment processes.

Draw minimum four sketches of valves used in the water supply pipeline.

Study the related free open software for the design of the water supply distribution network.

Prepare a report of minimum five pages on the plumbing system for an existing building (G+1 or above) in the nearby area.

Prepare a report of minimum five pages on the drainage system for an existing building (G+1 or above) in the nearby area.

#### Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

### VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications				
1	Digital pH meter (4 Digit Display (LED), 0 to 1000 mV, Resolution: 0.01 pH, Manual Temperature, Compensation: 0 to 80 degree C.)	1,12			
2	BOD incubator with BOD bottles (Rated Voltage: AC 220V±10% 50Hz, Power: 2800W, Temperature Controlling Mode: Digital Display, Temperature Controlling Point: 24 degree C, 93.5 degree C, Temperature Controlling Precision: ±0.1 degree C)	<b>G</b> 11			
3	Digital COD digester (Glassware: 15 Reaction Vessels & Air Condensers, Temperature: 150 $\pm$ 1% degree C, Capacity: 15 Samples at a time, Sample Size: 20 ml, Range: 0 to 500 ppm without dilution, Timer: 2 hours timer with Buzzer, Power Requirement: 230V 1000W	14			

Semester - 4, K Scheme

WATE	VATER AND WASTEWATER ENGINEERING Course Co			
Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number		
4	Digital Turbidity Meter. (Range 0 to 200 NTU, Resolution 1NTU, Accuracy: $\pm$ 3% FS, $\pm$ 1 Digit, Display 3½ Digit 7-Segment LED Light Source 6V, 0.3 Amp Tungsten Lamp, Detector: Photodiode, Sample System: 30 mm Clear Glass Test Tubes, Power 230 V $\pm$ 10% AC, 50 Hz, Accessories Test tube Set of 5, Operation Manual, Dust Cover.	2		
5	Electric Oven with digital control (Temperature: 300 degree C, 25 kg capacity)	3		
6	Digital DO meter (Range: 0 to 20 ppm, Resolution: 0.1 ppm, Temperature compensation: 0 to 50 degree C)	5,11,13,14		
7	Orthotolidine test kit (free and total chlorine testing for EPA reporting over the range of 0-4 mg/L.)	6		
8	Jar Test Apparatus (Digital timer: 1 to 99 minutes, material: Stainless steel, Power: Electric supply, Range: 25 to 250 rpm, with 6 glass jars of 1000 mL)	8		

# IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	Ι	Sources, Characteristics and Demand of Water	CO1	10	4	8	0	12
2	II	Purification of Water	CO2	16	6	6	6	18
3	III	Water Distribution System	CO3	8	2	4	4	10
4	IV	Building Sanitation System	CO4	14	2	4	10	16
5	V	Sewage Treatment System	CO5	12	0	8	6	14
		Grand Total		60	14	30	26	70

## X. ASSESSMENT METHODOLOGIES/TOOLS

### Formative assessment (Assessment for Learning)

• Two-unit tests of 30 marks each will be conducted and average of two-unit tests considered. For formative assessment of laboratory learning 25 marks. Each practical will be assessed considering appropriate % weightage to process and product and other instructions of assessment.

### Summative Assessment (Assessment of Learning)

• Assignment and Term Work, Written end semester examination.

## XI. SUGGESTED COS - POS MATRIX FORM

								07-0	6-2025 03:4	4:25 PM
WATER AND WASTEWATER ENGINEERING Course Code							Code	: 3143	\$14	
	Programme Outcomes (POs)									me c es* )
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	3	3	2	1	· · · · - · · · · · ·	2	3			
CO2	3	2	1	3	3	2	2			
CO3	3	2	2	3	2	2	1			
CO4	3	2	2	2	1	2	2			
CO5	-3	3	. 1 .	- 1	3	2	2			
Legends : *PSOs ar	- High:03, M	fedium:02	2,Low:01, No	Mapping: -		er set el				

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	N. N. Basak	Environmental Engineering	McGraw Hill Education India ISBN: 9780070494633, 0070494630.
2	Birdie, G. S. Birdie, J. S.	Water Supply and Sanitary Engineering	Dhanpat Rai and Sons, 2011 ISBN: 81874337954.
3	Garg, S.K.	Environmental Engineering Vol. I and Vol. II	Khanna Publishers, New Delhi, 2017, ISBN-10: 8174091203; ISBN-13: 978- 8174091208.
4	B. C. Punmia Ashok Jain Arun Jain	Environmental Engineering Vol. I & Vol. II Water Supply Engineering & Wastewater Engineering (Including Air Pollution)	Laxmi Publications (P) Ltd., New Delhi ISBN: 81-7008-092-4, ISBN-13: 9788131805961.
5	Nelson DI	Environmental Engineering	CBS Publisher and Distributer ISBN: 9788123928715.

## XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://ee1-nitk.vlabs.ac.in/List%20of%20experiments.html	Experiments for drinking Water.
2	https://ee1-nitk.vlabs.ac.in/	Experiments for drinking water and wastewater.
3	https://www.vlab.co.in/participating-institute-nitk-surathka l	Experiments for drinking water and wastewater.
4	https://www.vlab.co.in/ba-nptel-labs-civil-engineering	Experiments for drinking water and wastewater.

WATE	R AND WASTEWATER ENGINEERING	Course Code : 314314
Sr.No	Link / Portal	Description
5	https://iitb.vlabs.co.in/discipline.html?discipline=Civil_En gineering	Experiments for drinking water and wastewater.
6	https://nitsri.ac.in/Department/Library/List_VLabs	Experiments for drinking water and wastewater.
7	https://www.youtube.com/watch?v=V_bd-Ijo7Ic	Determination of pH.
8	https://www.youtube.com/watch?v=4AWR_xfwfi4	Turbidity Determination
9	https://www.youtube.com/watch? v=fHRxhuMQQnE&list=PLbRMhDVUMn gdeOSgQOe399aBKqdxkxNCp	Working of wastewater treatment Plant.
10	https://www.youtube.com/watch?v=4- SRMmqH2s4&list=PLLy_2iUCG8 7AZvtaiuD3r4HATrBKhb90P	Working of wastewater treatment Plant.
11	https://www.mpcb.gov.in./water-quality/standards-	Standard Norms as per MPCB
12	https://cpcb.nic.in/who-guidelines-for-drinking-water- quality/	Standard Norms as per CPCB
13	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https:// cpcb.nic.in/wqm/BIS_Drinking_Water_Specification.pdf	BIS: Drinking Water specifications (IS 10500:2012)
14	https://archive.nptel.ac.in/content/storage2/courses/1051041 02/Lecture%2014.htm	Water distribution systems
Note • 7	: Teachers are requested to check the creative common license status/fina online educational resources before use by the students	ncial implications of the suggested

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Semester - 4, K Scheme

GEOTECHNICAL E	NGINEERING	Course Code : 314315
Programme Name/s	: Civil Engineering/ Civil & Rural Engineering/ Cons Environmental Engineering/	struction Technology/ Civil &
Programme Code	: CE/ CR/ CS/ LE	
Semester	: Fourth	
Course Title	: GEOTECHNICAL ENGINEERING	
Course Code	: 314315	

#### I. RATIONALE

The stability of any structure depends upon behavior of soil and bearing capacity of soil to carry loads under different loading conditions. Thus, the geotechnical engineering enables the decision maker to predict the behavior of soil under different loading conditions and also to determine the probable settlement arising from the construction activities. This course therefore will develop the basic understanding among the students to ensure the safety, stability, and long-term quality in the wide range of civil engineering projects such as buildings, dams, towers, embankments, roads, railways, retaining walls, bridges, underground tank and underwater structures.

#### **II. INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Evaluate various soil properties required for design of foundation.

## **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Apply the basic knowledge of Geology and Geotechnical Engineering in given situation
- CO2 Measure the physical properties of given soil sample
- CO3 Determine the shear strength of given soil sample
- CO4 Use the relevant method of compaction to determine parameters of given soil sample
- CO5 Undertake the relevant soil investigation techniques to determine the bearing capacity of the given soil strata

#### IV. TEACHING-LEARNING & ASSESSMENT SCHEME

				L	earı	ninş	g Sche	eme	_				Α	ssess	ment	Sch	eme	1			
Course Code	Course Title	Abbr	Course Category/s	A C Hrs	onta s./W	al ict 'eek	SLH	NLH	Credits	Paper		The	ory		Ba	sed o T Prac	on LL L ctical	&	Base S	d on L	Total Morks
				CL	TL	LL				Duration	FA- TH	SA- TH	То	tal	FA-	PR	SA-	PR	SL	A	19141 K5
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314315	GEOTECHNICAL ENGINEERING	GTE	DSC	3	-	2	3	8	4	3	30	70	100	40	25	10	25#	10	25	10	175

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#### **GEOTECHNICAL ENGINEERING**

#### Course Code : 314315

#### Total IKS Hrs for Sem. : 1 Hrs

Abbreviations: CL- ClassRoom Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA - Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination, @\$ Internal Online Examination

Note :

- 1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
- 2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
- 3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
- 4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
- 5. 1 credit is equivalent to 30 Notional hrs.
- 6. \* Self learning hours shall not be reflected in the Time Table.
- 7. \* Self learning includes micro project / assignment / other activities.

#### V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
		Unit - I Overview of geology and geotechnical	
	TLO 1.1 Elaborate the	engineering	
	importance of geology in	1.1 Introduction to Geology: Branches, importance of	
	civil engineering field.	geology, composition of earth.	
	TLO 1.2 Classify the given	1.2 Petrology: Definition of a rock, classification based on	Lecture Using
	type of rocks based on their	their genesis (mode of origin), formation, classification and	Chalk-Board
	genesis.	engineering uses of igneous, sedimentary and metamorphic	Presentations
1	TLO 1.3 Signify the	rocks. (IKS*: Sun temple of Konark made up of Chlorite,	Demonstration
	importance of soil as a	Laterite, Khondalite stones)	Site/Industry
	construction material.	1.3 IS definition of soil, Importance of soil in Civil	Visit
	TLO 1.4 Justify the	Engineering as construction material for foundation bed of	Case Study
	importance of Geo-	structures.	
	technical Engineering in	1.4 Field applications of geotechnical engineering for	
	civil Engineering.	foundation design, pavement design, design of earth	
		retaining structures, design of earthen dam.	



GEO	<b>FECHNICAL ENGINEERI</b>	NG Cou	rse Code : 314315
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Elaborate the physical properties of soil. TLO 2.2 Determine the Index properties of given soil sample using the relevant method. TLO 2.3 Draw the particle size distribution curve for the given sample with its interpretation. TLO 2.4 Interpret the computed values of Atterberg's limits of Consistency for the given soil specimen data.	<ul> <li>Unit - II Physical and Index Properties of Soil</li> <li>2.1 Physical Properties: Soil as a three phase system, water content, void ratio, porosity and degree of saturation, density index, unit weight of soil mass; bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight, specific gravity</li> <li>2.2 Determination of Index Properties of Soil: determination of water content by oven drying method as per IS code, determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code, determination of specific gravity by pycnometer.</li> <li>2.3 Particle size distribution, mechanical sieve analysis as per IS code, particle size distribution curve, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils, particle size. classification of soils, I.S. classification of soil.</li> <li>2.4 Consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index, determination of liquid limit, plastic limit</li> </ul>	Lecture Using Chalk-Board Presentations Demonstration Hands-on Site/Industry Visit
3	TLO 3.1 Apply the Darcy's law of permeability in given situation to determine the coefficient of permeability for a given soil sample. TLO 3.2 Apply the concept of flow net in the given situation. TLO 3.3 Draw the Mohr- coulomb failure envelope for the given type of soil sample. TLO 3.4 Use the relevant method to determine shear strength of given soil sample.	<ul> <li>Unit - III Permeability and Shear Strength of Soil</li> <li>3.1 Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head permeability tests, simple problems to determine coefficient of permeability.</li> <li>3.2 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems.)</li> <li>3.3 Shear failure of soil, field situation of shear failure, concept of shear strength of soil, components of shearing resistance of soil – cohesion, internal friction. Mohrcoulomb failure theory, Strength envelope, strength Equation for purely cohesive and cohesion less soils.</li> <li>3.4 Laboratory methods: Direct shear test, vane shear test (Numerical on direct shear test only)</li> </ul>	Lecture Using Chalk-Board Presentations Demonstration Hands-on Site/Industry Visit

GEOI	JEO I ECHNICAL ENGINEERING Course						
Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.				
4	TLO 4.1 Undertake the compaction of given sample using relevant method of compaction. TLO 4.2 Use the relevant method of soil stabilization for the given situation as per IS code. TLO 4.3 Determine the CBR value of given soil sample as per IS code. TLO 4.4 Explain the lateral earth pressure theory with labelled sketch for given situation.	<ul> <li>Unit - IV Compaction and Stabilization of soil</li> <li>4.1 Concept of compaction, purpose of compaction, field situations where compaction is required, Standard proctor test – test procedure as per IS code, Compaction curve, optimum moisture content, maximum dry density, Zero air voids line, Modified proctor test, factors affecting compaction, field methods of compaction : rolling, ramming and vibration, concept of consolidation, difference between compaction and consolidation.</li> <li>4.2 Concept of soil stabilization, necessity of soil stabilization</li> <li>4.3 California bearing ratio, C.B.R. test, interpretation of C.B.R. values.</li> <li>4.4 Definition of earth pressure, lateral earth pressure at rest, active earth pressure and passive earth pressure with no surcharge condition, coefficient of earth pressure, Rankine's theory and its assumptions.</li> </ul>	Lecture Using Chalk-Board Presentations Video Demonstrations Hands-on Site/Industry Visit				
5	TLO 5.1 Undertake relevant Exploration Technique for evaluating soil strata. TLO 5.2 Determine the bearing capacity of soil using the relevant data for the given soil sample. TLO 5.3 Justify the need of field test in determining the bearing capacity of the soil for the given strata	Unit - V Site Investigation and Bearing Capacity of Soil 5.1 Site Investigation: Necessity of site investigation and sub-soil exploration, types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil: dry strength test, dilatancy test and toughness test, Determination of free swell index. 5.2 Bearing capacity: Definition of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure, Introduction to Terzaghi's analysis and its assumptions (No Numerical). Types of failures in soil: general, local and punching shear failure, effect of water table on bearing capacity. 5.3 Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS: 1888 & IS:2131	Lecture Using Chalk-Board Presentations Video Demonstrations Collaborative learning Site/Industry Visit				

## VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify the type of given rock specimen.	1	*Identification of rocks from the given specimen	2	CO1
LLO 2.1 Use oven drying method to determine the percentage of moisture content in given soil specimen.	2	*Determination of moisture content of given soil sample by oven drying method as per I.S. 2720 part- II	2	CO2
LLO 3.1 Use pycnometer method for determining specific gravity of given soil sample to classify its type.	3	*Determination of specific gravity of soil by pycnometer method as per I.S. 2720 part- III.	2	CO2
LLO 4.1 Undertake the core cutter method to find bulk and dry unit weight of given soil sample in field.	4	*Determination of Bulk and dry unit weight of soil in field by core cutter method as per I.S. 2720 (Part- XXIX).	2	CO2

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Semester - 4, K Scheme

GEOTECHNICAL ENGINEERING Course Code : 31431							
Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs			
LLO 5.1 Undertake the sand replacement method to find bulk and dry unit weight of coarse-grained soils.	5	Determination of bulk and dry unit weight of soil in field by sand replacement method as per I.S. 2720 (Part- XXVIII).	2	CO2			
LLO 6.1 Classify type of soil based on grain size distribution.	6	*Determination of grain size distribution of given soil sample by mechanical sieve analysis as per I.S. 2720 (Part- IV).	2	CO2			
LLO 7.1 Identify given soil based on plasticity chart.	7	*Determination of Plastic Limit & Liquid Limit along with Plasticity Index of given soil sample as per I.S. 2720 (Part- V).	2	CO2			
LLO 8.1 Find co efficient of permeability of soil through coarse grained soils and fine grained soil.	8	*Determination of co efficient of permeability by constant head test as per I.S. 2720 (Part- XVII) or Determination of co efficient of permeability by falling head test as per I.S. I.S. 2720 (Part- XVII)	2	CO3			
LLO 9.1 Determine the shear strength of soil sample using direct shear test.	9	Determination of shear strength of soil by direct shear test as per I.S. 2720 (Part-XIII)	2	CO3			
LLO 10.1 Determine shear strength of soil in undisturbed as well as remoulded cohesive soil sample.	10	Determination of shear strength of soil by vane shear test as per I.S. 2720 (Part-XXX)	2	CO3			
LLO 11.1 Perform standard proctor test to determine parameters such as OMC, MDD and amount of compaction	11	*Determination of OMC and MDD by standard proctor test of given soil sample as per I.S. 2720 (Part- VII).	2	CO4			
LLO 12.1 Perform modified proctor test to determine parameters such as OMC, MDD and amount of compaction	12	Determination of OMC and MDD by Modified proctor test of given soil sample as per I.S. 2720 (Part- VIII).	2	CO4			
LLO 13.1 Perform the CBR test on a given soil sample to evaluate thickness of pavement	13	Determination of CBR value as per IS 2720 (Part-16).	2	CO4			
LLO 14.1 Classify given soil sample by conducting field tests Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.	14	Use of field tests to idendify type of given soil sample.	2	CO5			
LLO 15.1 Find degree of Expansiveness of given soil based on free swell index.	15	Determination of free Swell index of soil as per IS 2720 (Part 40)	2	CO5			

#### Note : Out of above suggestive LLOs -

- '\*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

# VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)

### SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)/ASSIGNMENTS

## **GEOTECHNICAL ENGINEERING**

#### 07-06-2025 03:44:38 PM Course Code : 314315

- a. Collect the data of various rock specimen such as igneous, sedimentary, metamorphic and compare their properties with respect to geotechnical Engineering.
- b. Collect minimum three pictures rock mass showing Folds, Faults, Joints along with description.
- c. Observe open source videos for determination of Shrinkage limit of soil sample as per I.S. 2720 (Part- V) and write a procedure.
- d. Determine bearing capacity of soil using assumed value of liquid limit and plastic limit and show calculations (Workout bearing capacity of soil using established co relation.)
- e. Enlist minimum five compaction equipments along with their description
- f. Enlist various soil stabilization techniques and write information of any three (including sketches).
- g. Comment in the form of report on the effect of unconsolidated undrained, consolidated undrained and consolidated drained in shear test
- h. Summarize the importance of Geosynthetic materials including their applications in civil Engineering
- i. Summarize in the form report on the importance of piles including sketches and case studies
- j. Write a report on role of Geophysical Exploration in civil Engineering.

#### Micro project

- a. Collect minimum five types of rock specimen in your area and compare their properties with respect to geotechnical Engineering aspect
- b. Visit nearby site having excavation pits and write short note about it strata by visual inspection.
- c. Collect minimum three samples of soil in your area and compare them for any three properties of soil
- d. Visit nearby reclamation land and study the stabilization method.
- e. Identity two different locations and suggest the appropriate stabilization methods (soil-cement, soil-lime, soil-flyash etc.) to improve its engineering properties.
- f. Study different free open sources software available for Geotechnical Engineering.
- g. Collect the photograph and information of anchors (stabilization of slopes) used to avoid over turning of structure.
- h. Collect the photographs and information on Causes, Effects and Types of Landslides.
- i. Collect information on foundations of ancient structures with Geotechnical Engineering aspect.
- j. Visit nearby two sites to classify soil based on field tests.

#### Note :

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

## VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vane shear test apparatus- as per 2720 (Part -30)	10
2	Proctor compactometer for light compaction and heavy compaction as per IS specification	11,12
3	CBR apparatus as per IS specification IS 2720 (Part-16).	13

GEOT	GEOTECHNICAL ENGINEERING Co					
Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number				
4	425 micron IS Seive and 100ml capacity graduated glass cylinder	15				
5	Oven-thermostatically controlled to maintain temperature of 110 degree Celsius to 115 degree Celsius	2,3,4,7,11,12				
6	Pycnometer – consisting of 1 kg. honey /fruit jar with plastic cone, locking ring and rubber seal.	3				
7	Core cutter apparatus- cylindrical core cutter of steel 100 mm dia x 127.3mm high with 3mm wall thickness beveled at 1mm.	4				
8	Sand replacement apparatus- as per IS: 2720(Part-28)	5				
9	Mechanical sieve shaker- carries up to 7 sieves of 15 cm to 20 cm dia (as per IS 2720-(Part 4)1985)	6				
10	Casagrande liquid limit apparatus- as per IS: 9259-1979	7				
11	Constant head permeameter- as per IS:2720(Part-4)1986	8				
12	Falling head permeameter -as per IS:2720(Part-4)1986	8				
13	Direct shear test apparatus- as per IS: 2720(Part 13) 1986	9				

# IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R- Level	U- Level	A- Level	Total Marks
1	Ι	Overview of geology and geotechnical engineering	CO1	5	4	4	0	8
2	II	Physical and Index Properties of Soil	CO2	12	4	. 4	12	20
3	III	Permeability and Shear Strength of Soil	CO3	10	2	8	6	16
4	IV	Compaction and Stabilization of soil	CO4	10	4	4	6	-14
5	V	Site Investigation and Bearing Capacity of Soil	CO5	8	0	8	4	12
		Grand Total		45	14	28	28	70

## X. ASSESSMENT METHODOLOGIES/TOOLS

### Formative assessment (Assessment for Learning)

• Two unit test of 30 marks will be conducted and average of two unit test is considered, Assessment of laboratory learning, Assignment, Microproject, Self learning (60% Weightage to process and 40% weightage to product), Question and Answer.

### Summative Assessment (Assessment of Learning)

• Pen and Paper Test (Written Test), Practical Exam/ Oral Exam

## XI. SUGGESTED COS - POS MATRIX FORM

								07-0	6-2025 03:4	4:38 PM
GEOTECHNICAL ENGINEERING Course Code : 31										515
			Progra	amme Outco	mes (POs)	2		Pro S Ou (	ogram pecifi itcom PSOs	me c es* )
Course Outcomes (COs)	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO- 1	PSO- 2	PSO- 3
CO1	3		- 1	2	1	1 . <b>-</b> 1	2			
CO2	3	3	. 1	3	2	1	3			
CO3	2	2 .	1	2	1	2	2			
CO4	2	2	2	2	2	1	2			
CO5	2	2	2	2	2	1	2			
Legends :	- High:03, N	/ledium:02	2,Low:01, No	Mapping: -						

\*PSOs are to be formulated at institute level

## XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number		
1	Dunmia B C	Soil Mechanics and Foundation	Laxmi Publication (P) ltd., New Delhi, ISBN		
	Tullilla, D.C.	Engineering	9788170087915		
2	Murthy VNS	A text book of soil mechanics and	CBS Publishers & Distributors Pvt. Ltd., New		
2	winning, v.iv.s.	foundation Engineering	Delhi 2016 ISBN: 9788123913629		
3	Ramamurthy, T.N. &	Geotechnical Engineering (Soil	S Chand and Company LTD., New Delhi,		
5	Sitharam, T.G.	Mechanics)	ISBN: 9788121924573		
1	Braia M. Das	Principles of Geotechnical	Cengage Learning ISBN: 9789355738103		
-	Diaja Mi. Das	Engineering			
5	Darbin Singh	Engineering And General	S K Kataria and Sons ISBN-13 978-		
	i arom Singh	Geology	8188458516		

## XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/N2J-tvEeI4c? si=SgQPoICSbFAuOVLd	Determination of Water Content of Soil by Oven Drying Method
2	https://youtu.be/l6vk0EM4yPg?si=- M6WwrpxOlZYHy94	Determination of Specific Gravity of soil
3	https://youtu.be/5rDHjZ_RJq0? si=V714qwz1vE8f5pSP	Determination of Dry Density of Soil by Core Cutter Method
4	https://youtu.be/YejCi5SEOAU? si=n8w1uAauI7ZgaG9P	Determination of Dry Density of Soil by Sand Replacement Method
5	https://youtu.be/pM-w_cvk1nA? si=3evWNLPjtwFxtsP0	Determination of Liquid Limit and Plastic Limit of Soil
6	https://youtu.be/bmpn5oNDvOs? si=LxcoQUSe_lmL3QQ1	Direct Shear Test
7	https://youtu.be/CAezS3mPzOc?si=9- bIMPqTKy1MuPDG	Grain Size Analysis of Soil

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Semester - 4, K Scheme

GEOI	TECHNICAL ENGINEERING	Course Code : 314315
Sr.No	Link / Portal	Description
8	https://youtu.be/c4i_y6u-tsE?si=BjcItf55LqNn2Ihn	Water Content Dry Density Relation Using Light Compaction OMC and MDD
9	https://youtu.be/fCmMW73rP64? si=mdAiq1WPkpc9n1Dl	California Bearing Ratio (CBR) value test
10	https://youtu.be/Lrml0egYtM4? si=ag1mezmk74UAuyCf	Determination of swelling properties (Free Swell Index of Soil)
11	https://smfe- iiith.vlabs.ac.in/List%20of%20experiments.html	Virtual laboratory practical for Soil Mechanics.
12	https://youtu.be/8Q8CZW9-jXE? si=8Yrf2NvS9b5v9kcF	A Soil Investigation Work (Borehole Drilling: SPT & Rock Coring)
13	https://www.ijsrp.org/research-paper-0121/ijsrp- p10935.pdf	The Architectural Study of Sun Temples in India: Based on Location, Construction Material and Spatial Analysis Study
14	https://youtu.be/QuE4tEK-5iY? si=t61uZOWhS_nd5z8H	Shallow Foundation: Plate Load Test
15	https://youtu.be/DjWDOqQjsyQ? si=k43rXl2I19YK9msV	How to conduct SPT / Standard Penetration Test/ Soil Exploration Technique/ Site Investigation
Noto	•	

• Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

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Semester - 4, K Scheme

	: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/
	Artificial Intelligence and Machine Learning/ Automation and Robotics/
	Architecture/ Cloud Computing and Big Data/
	Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer
	Engineering/
	Civil & Rural Engineering/ Construction Technology/ Computer Science &
	Engineering/ Fashion & Clothing Technology/
	Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/
	Electrical Engineering/
	Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/
	Electrical Power System/ Electronics & Communication Engg./
Programme Name/s	Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/
	Hotel Management & Catering Technology/
	Instrumentation & Control/ Industrial Electronics/ Information Technology/
	Computer Science & Information Technology/
	Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil &
	Environmental Engineering/
	Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Mining & Mine Surveying/
	Mine Surveying, Medical Flectronics/ Mining Engineering/ Production Engineering/ Printing
	Technology/
	Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile
	Technology/
	Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures
	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/
<b>Programme Code</b>	DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/
5	ME/ MK/ ML/ MS/ MU/ MZ/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX
Semester	: Second
Course Title	: EXIT INDUSTRIAL TRAINING ( Full Time )
<b>Course Code</b>	: 312021

## I. RATIONALE

This exit industry training is proposed for the student who seeks exit at the end of the 4th semester to get the Diploma of Vocation. This Exit industry training is aimed to impart employable skills in the respective field to get some job/employment. Students are expected to learn the work practice and environment of industry and develop a report. On the basis of this report the institute will consider for the exit.

## III. COURSE LEVEL LEARNING OUTCOMES (COS)

At the end of training, proposed for Exit with Voc. Diploma, the pass out will be able to;

- CO1 Gain hands-on experience in applying theoretical concepts to real-world tasks, improving their understanding and problem-solving abilities and readiness for the workforce.
- CO2 Boosts students' self-confidence and encourages them to pursue ambitious career goals. to earn a livelihood for a better status in society.
- CO3 Interact with industry professionals during training to build valuable connections for job opportunities.

## EXIT INDUSTRIAL TRAINING (Full Time)

## IV. TEACHING-LEARNING & ASSESSMENT SCHEME

	Course Title			L	ear	ninş	g Sch	eme			Assessment Scheme										
Course Code			Course	Actual Contact Hrs./Week		£		Cuadita	h	Theory		Based on LL & TL			&	Based on SL		Total			
		ADDF	<sup>or</sup> Category/				SLH NLH		Credits	Paper Duration				Practical						Total Morks	
				CL TL		LL				Duration	FA- SA- TH TH Total		FA-PR SA-PR			PR	SLA				
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
312021	EXIT INDUSTRIAL TRAINING ( Full Time )	EXIT	INP	-	-	-	-	0	4	-	-	-	-	-	-	-	50@	20	-	-	50

## I .General guidelines for organizing Industrial training

The Industry/organization selected for Industrial training/ internships shall be Government / Public Limited/ Private limited / Startup /Centre of Excellence/Skill Centers/Skill Parks etc.

a) Duration of Training - 4-6 weeks students engagement time (Min. 28-30 hrs./week)

b) Period of Time slot - After 4th Semester

c) Industry area - Engineering Programme Allied industries of large, medium or small-scale, Organization/Govt./ Semi Govt Sectors.

## **II.** Role(s) of Department at the Institute:

Concerned department Head or associated faculty at the Polytechnics shall place the student for internships, coordinate with the industry/organisation and monitor the attendance and progress of the student. Acquire the undertaking from Parents/Guardians(Format 1) and Student(Format 2).

### **III.** Role(s) and Responsibilities of students:

a) Students may interact with the faculty mentor to suggest choices for suitable industry, if any. In case of students have any contact in industry through their parents or relatives then same may be utilized for securing placement for themselves and their peers.

b) Students have to fill the forms/formats duly signed by institutional authorities along with training letter and submit it to training officer/mentor in the industry on the first day of training.

c) Students must carry with him/her Identity card issued by the institute during training period.

d) Students should follow industrial dressing protocols, if any. In absence of specific protocol student must wear college uniform compulsorily.

e) Students will have to get all necessary information from the training officer/mentor at industry regarding schedule of training, rules and regulation of the industry and safety norms to be followed. Students are expected to observe these rules, regulations and procedures.

f) Students must be fully aware that if they disobey any rule of industry or do not follow the discipline then non-disciplinary action will be taken

g) Students must Maintain weekly diary (Format 3) by noting daily activities undertaken and get get it duly signed from industry mentor or Industrial training in charge.

h) In case students faces any major problems in industry such as an accident or any disciplinary issue then they should immediately report the same to the mentor at the institute

i) Prepare final report about the training for submitting to the department at the time of presentation and viva-voce and get it signed from mentor as well as industry training in charge.

j) Student must submit the undertaking as provided in Format 2.

## IV. Typographical guidelines for Industry Training report

Following is the suggestive format for preparing the training report. Actual report may differ slightly depending upon the nature of industry. The training report may contain the following

- a) The training report shall be computer typed (English- British) and printed on A4 size paper.
- b) Text Font -Times New Roman (TNR), Size-12 point
- c) Subsection heading TNR- 12 point bold normal
- d) Section heading TNR- 12 capital bold
- e) Chapter Name/ Topic Name TNR- 14 Capital
- f) All text should be justified. (Settings in the Paragraph)

g) The report must be typed on one side only with double space with a margin 3.5 cm on the left, 2.5 cm on the top, and 1.25 cm on the right and at bottom.

h) The training report must be hardbound/ Spiralbound with cover page in black colour. The name of the candidate, diploma (department), year of submission, name of the institute shall be printed on the cover [Refer sample sheet (outer cover)]

i) The training report, the title page should be given first then the Certificate followed by the acknowledgment and then contents with page numbers.

## V. Suggestive format of industrial training report

Following format may be used for training report. Actual format may differ slightly depending upon the nature of Industry/ Organization.

- Title Page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1	Organization structure of Industry and general layout.
Chapter 2	Introduction to Industry / Organization (history, type of products and services, turn over and number of employees etc.)
Chapter 3	Types of Major Equipments/raw materials/ instruments/machines/ hardware/software used in industry with their specifications, approximate cost, specific use and routine maintenance done
Chapter 4	Processes/ Manufacturing Manufacturing techniques and methodologies and material handling procedures
Chapter 5	Testing of Hardware/Software/ Raw materials/ Major material handling product (lifts, cranes, slings, pulleys, jacks, conveyor belts etc.) and material handling procedures.
Chapter 6	Safety procedures followed and safety gears used by industry.
Chapter 7	Particulars of Practical Experiences in Industry/Organization if any in Production/Assembly/Testing/Maintenance
Chapter 8	Detailed report of the tasks undertaken (during the training).
Chapter 9	Special/challenging experiences encountered during training if any (may include students liking & disliking of work places).
Chapter 10	Conclusion
Chapter 11	References / sources of information
	• • • • • • • • • • • • • • •

## VI. Suggested learning strategies during training at Industry

## EXIT INDUSTRIAL TRAINING ( Full Time )

1	Introduction of Industry and departments.
2	Study of Layout of Industry, Specifications of Machines , raw materials, components available in
Ζ.	the industry
2.5	Execute given project or work assigned to the students, study of safety and maintenance
5-5	procedures
4/6	Report writing

## VII. Summative Assessment (SA) of training:

Academic year : 20 -20

Name of the industry:

Marks Acquired :

			<b>Observations fro</b>	om Orals			
Sr. No	Enrolment Number	Name of student	Knowledge about Industry & Departments (10 Mks.)	Knowledge of Layout/M/C Specifications/ Components etc (10 Mks.)	Skill Developed (10 Mks.)	Submitted Report (20 Mks.)	Total 50

Name of mentor :

Signature of Mentor :

500

**VII. FORMATS** 

#### Format-1

## **Consent Letter from parents/guardians**

(Undertaking from Parents)

To,

The Principal,

\_\_\_\_\_,

Subject: Consent for Industrial Training.

Sir/Madam,

I am fully aware that -

- 1. My ward studying in \_\_\_\_\_\_ semester at your \_\_\_\_\_\_ institute has to undergo \_\_\_\_\_weeks of Industrial training for partial fulfillment towards completion of Diploma in Engineering.
- 2. For this fulfillment he/she has been deputed at \_\_\_\_\_\_ industry, located at \_\_\_\_\_\_ for Industrial training /internship for the period from \_\_\_\_\_\_ to

With respect to above I give my full consent for my ward to travel to and from the mentioned industry. Further I undertake that –

- 1. My ward will undergo the training at his/her own cost and risk during training and/or stay.
- 2. My ward will be entirely under the discipline of the organization where he/she will be placed and will abide by the rules and regulations in face of the said organization.
- 3. My ward is NOT entitled to any leave during training period.
- 4. My ward will submit regularly a prescribed weekly diary, duly filled and countersigned by the training supervisor of the organization to the mentor faculty of the polytechnic.

I have explained the contents of the letter to my ward, who has also promised to adhere strictly to the requirements. I assure that my ward will be properly instructed to take his own care to avoid any accidents/injuries in the industry. In case of any accident neither industry nor the institute will be held responsible.

Signature of Parent/Guardian :

Name :

Address :\_\_\_\_\_

Phone Number:

Date : \_\_\_\_\_

Semester - 2, K Scheme

Name and Signature of the student:

Phone Number of students:

Format-2

## Undertaking by the students

TO

The Principal

-----

Subject: Undertaking regarding Placement for Industrial training of 12/16/18 weeks duration

I \_\_\_\_\_ Enrollment No \_\_\_\_\_ S/o/D/o. \_\_\_\_\_ studying in \_\_\_\_\_ at \_\_\_\_\_ Institute at \_\_\_\_\_\_ fully aware of the Industrial Training requirement and related responsibilities and participation in the \_\_\_\_\_\_ Industrial training From: \_\_\_\_\_\_ To

I assure you that I will be of good behavior and be obedient to the staff and mentor during the \_\_\_\_\_\_\_\_/Industrial training. I will also abide and will not participate in all activity. I will also discipline myself within the rules and regulations of the Institution. I am also aware that I am participating in the \_\_\_\_\_\_\_ at my own risk and I will not hold the \_\_\_\_\_\_\_ Institute responsible in any way in any eventuality namely Accident /Injury/death or whatever mishap and I myself will be solely responsible for my safety.

Place :

Signature of the student

Date :

#### Format-3

## **Internships Daily Diary**

Name of the Student: \_\_\_\_\_ Name of the mentor (Faculty) : \_\_\_\_\_

 Enrollment Number:
 \_\_\_\_\_\_ Semester:
 \_\_\_\_\_\_ Academic Year

Week	Day & Date	Discussion Topics/Activity	Details of Work Allotted Till Next Session /Corrections Suggested/Faculty Remarks	Signature of Industry Mentor
	Mon, Date			
	Tue, Date			
Week 01	Wed, Date			
WCCK UI	Thu, Date			
	Fri, Date			
	Sat, Date			
	Mon, Date			
	Tue, Date			
•	Wed, Date			
	Thu, Date			
	Fri, Date			
•	Sat, Date			
	Mon, Date			
	Tue, Date			
Wools n	Wed, Date			
WCCK II	Thu, Date			
	Fri, Date			]
	Sat, Date			

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	: Architecture Assistantship/ Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/
	Artificial Intelligence and Machine Learning/ Automation and Robotics/ Architecture/ Cloud Computing and Big Data/
Programme Name/s	Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ Dress Designing & Garment Manufacturing/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ Hotel Management & Catering Technology/
	Instrumentation & Control/ Industrial Electronics/ Information Technology/ Computer Science & Information Technology/ Instrumentation/ Interior Design & Decoration/ Interior Design/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Laboratory Technology/ Mining & Mine Surveying/ Medical Electronics/ Mining Engineering/ Production Engineering/ Printing Technology/ Polymer Technology/ Surface Coating Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Travel and Tourism/ Textile Manufactures
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DD/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ HM/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MS/ MU/ MZ/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX
Semester	: Second
<b>Course Title</b>	: SECOND YEAR EXIT COURSE ( Online )
<b>Course Code</b>	: 312022

#### I. RATIONALE

The National Education Policy 2020 necessitates "Academic Flexibility", means the provision for innovative and interchangeable curricular structures to enable creative combinations of Courses or Programmes in Disciplines of study leading to Degree or Diploma or Post Graduate Diploma or Certificate of Study offering multiple entry and multiple exit facilities, while removing rigid curricular boundaries and creating new possibilities of life-long learning;

To ensure that the exiting student: exits with market relevant competency ,offering the on-line skill based course in the absence of internships opportunity is the best option .

#### **III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 Demonstrate required skills and readiness relevant to their discipline (e.g., mechanical, civil, electrical, software engineering, hotel management textiles etc.) to join the workforce.
- CO2 Practice the skills of using industry specific software, tools, machines, methodologies etc. required at the work place of an employer and earn livelihood.
- CO3 Work collaboratively as professional in group as member and leader to complete the tasks of employers.

#### IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Course Title     Abbr     Actual Contact Hrs./Week     Actual Contact Hrs./Week     Paper Duration     Theory     Based on LL & Based on SL     Based on SL       Course Title     Abbr     Course Course Category/s     SLH     NLH     Credits     Paper Duration     FA- SA-     Total Marks					Le	earnin	g Sche	me					Assess	ment Sche	eme		
Duration FA- SA- T + L FA PD SA PD S	Course Code	Course Title	Abbr	Course Category/s	Ac Co Hrs.	ctual ntact /Week	SI H	NI H	Credits	Paper		The	ory	Based o T Prac	on LL & L	Based on SL	Total
	cout			euroger jis	CI I	<b>FT T T</b>	SLII		-	Duration	FA-	SA-	T- 4-1	EA DD	CA DD	CI A	Marks
											Max	Max	Max Min	Max Min	Max Min	Max Min	

312022 SECOND YEAR EXIT COURSE ( Online ) SYEC	SEC	-	-	-	-	0	4	-	-	-	-	-	-	-	50@	20	-	-	50
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#### V. Guidelines –

#### A) General Guidelines

1. This exit Course should be offered only in absence of opportunities for Exit Internships .

- 2. An exit course should focus on
  - equipping students with skills that are directly applicable to the job market trends for the level of exit from the field of study of diploma programme.
  - The course must have the scope of practical skills and knowledge may be multidisciplinary that are in high demand at job market.

Upon completion of this course, students can earn a certificate that demonstrates their readiness to enter the workforce .

- 3. There are several govt./semi govt. recognized agencies and organizations which offers online courses of 90 to 120 hrs of study engagement to enhance their skills and employability of potential learners. Depending on the student's field of study and career goals, they can choose from various platforms to enhance their employability and skill set before entering the workforce.
- 4. Online/ platforms of AICTE, NSDC, Coursera, edX, Udacity, Skillshare, Infosys springboard, SWAYAM etc. or other relevant platform may be referred for online course as exit course. These platforms often partner with universities, industry leaders, or educational institutions to provide high-quality, industry-relevant content.
- 5. Multiple courses can be offered .The offered course/s must encompass 80 to 120 hrs. of study engagement. Multiple short duration courses leading to the desired minimum duration form 80 to 120 can also be offered.
- 6. Study engagement hours shall be taken into account. For example if the online 'X' course is of 4 hours, the students may require 10 hrs. to undertake the course and in such cases the student may undertake multiple courses oriented towards developing appropriate aligned skills. Faculty decides the course engagement duration based on the complexity of the course and accordingly assigns course/es to the exiting student.

Ex :- If an 'Y' course on Infosys springboard is 3.5 hrs, the students may require 8 hrs of study engagements to complete the lecture due to recap, assignments, tests etc. and accordingly other courses maybe selected such that the study engagements of 90-120 hrs. is undertaken.

- 7. Course/es should not incur financial overheads on students.
- 8. Certificate of completion of Exit Industrial Training shall be provided by the institute based on the evaluation through orals.



#### **B)** Suggested RUBRIC for SA

#### **Title : Second Year Exiting Students**

Enrollment	Courses Undertaken	No.Of Hrs.	Overall Understanding (20 Mks.)	Knowledge/Skill Acquired (20 Mks.)	Certification (10 Mks.)	Total (50 Mks.)
Number	1					
	2					
	3					

#### **C) Suggestive Courses**

• Title/Modules/Area for Programme-wise possible exit courses are suggested below and students may explore more under guidance of programme head/teachers of the relevant discipline/branch.

NOTE : Below are just the groupwise list of suggestive courses . Multiple or single course depending on the number of student engagement hours can be selected from them. Respective programme head/faculty are free to decide appropriate skill based course / es as per guidelines given above.

		Programme Group – (	CO Group		
Sr. No.	Title of Skill Oriented Second Year Exit Course	Source Organization	Reference Link	Duration	<b>Brief Description</b>
1	Explore Machine Learning Using Python	Infosys Springboard	<u>TOC - Explore Machine</u> <u>Learning using Python  </u> <u>Infosys Springboard</u>	17Hr 7 min	This course introduces concepts of machine learning like supervised and unsupervised learning techniques and demonstrates their application on various data sets. It also gives an overview of artificial neural networks.
2	Unity Game - Role Playing Game(RPG)	Infosys Springboard	<u>TOC - Unity Game -</u> <u>Role Playing</u> <u>Game(RPG)   Infosys</u> <u>Springboard</u>	10Hr 28 min	Unity is well known as a massive game developing middleware system with a user friendly editor and power house features. As 3D games has always been leading the gaming
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3	Unreal Engine Game - Pinball Game	Infosys Springboard	TOC - Unreal Engine Game - Pinball Game   Infosys Springboard	15 Hr 8 Min	Unreal Engine 4 is a suite of integrated tools for game developers to design and build games, simulations, and visualizations. Through this training we shall introduce you to the exciting gaming world and introducing you this powerful game engine Unreal. There are lots of code samples available but offer little or no explanation on how they should be used. This training aims to provide the necessary training to teach you how to create those awesome games. Through this tutorial we are going to create a live game the Pinball game using Unreal engine
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4	Python Machine Learning Solutions	Infosys Springboard	TOC - Python Machine Learning Solutions   Infosys Springboard	5 Hr 32min	Machine learning is increasingly pervasive in the modern data-driven world. It is used extensively across many fields such as search engines, robotics, self- driving cars, and more. With this course, you will learn how to perform various machine learning tasks in different environments. Throughout the course, you'll use a wide variety of machine learning algorithms to solve real-world problems and use Python to implement these algorithms. You'll discover how to deal with various types of data and explore the differences between machine learning paradigms such as supervised and unsupervised learning. We also cover a range of regression techniques, classification algorithms, predictive modelling, data visualization techniques, recommendation engines, and more with the help of real-world examples
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#### SECOND YEAR EXIT COURSE ( Online )

#### Course Code : 312022

5	Unity Game - Gem Collector Game	Infosys Springboard	<u>TOC - Unity Game -</u> <u>Gem Collector Game</u> <u>Infosys Springboard</u>	3 Hr 4 min	Developing your script, designing the look and doing the coding is all a part of a game development. So, we brought you this course Create Gem Collector game using Unity training, to help you master the advanced tricks and techniques that usually go with the gaming industry workflow.
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### SECOND YEAR EXIT COURSE ( Online )

#### Course Code : 312022

6	Hands-on Scikit-learn for	Infosys Springboard	TOC - Hands-on Scikit-	10Hr 2	Scikit-learn is
0	Machine Learning	iniosjs springeouru	learn for Machine	min	arguably the most
			Learning   Infosys		popular Python
			Springboard		library for Machine
					Learning today.
					Thousands of Data
					Scientists and
					machine Learning
					for day to day tasks
					throughout a
					Machine Learning
			Y		project's life cycle.
					Due to its
					popularity and
					variety of ML
					models and built-in
					utilities, jobs for
					Scikit-learn are in
					high demand, both
					in industry and
					academia. If you re
					learning engineer
					ready to take real-
					world projects
					head-on, Hands-on
					Scikit-Learn for Machine Learning
					will walk you
					through the most
					commonly used
					models, libraries,
					and utilities offered
					by Scikit-learn. By
					course, you will
					have a set of ML
					problem-solving
					tools in the form of
					code modules and
					utility functions
					learn in one place
					instead of spread
					over several books
					and courses, which
					you can easily use
					on real-world
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					projects and data
7	UX Design for Web Developers	Infosys Springboard	.TOC - UX Design for Web Developers   Infosys Springboard	4 Hr 44 min	sets. UX Design for Web Developers is a comprehensive course that teaches web developers the principles and techniques of user experience (UX) design. It covers topics such as empathetic design, information architecture, wireframing, responsive design, usability testing, and prototyping. Participants will learn how to create user-centered and visually appealing websites by understanding user needs, organizing content effectively, and designing intuitive interactions. The course also explores best practices for mobile and desktop design, ensuring a seamless user experience across different devices
		Programme Group	) - AA		
1	Architectural Graphics	<b>IS 962:1989</b> - Code of Practice for Architectural and Building Drawings.		8 weeks	<b>IS 962:1989</b> - Code of Practice for Architectural and Building Drawings.
2	Computer Aided Drawing	<b>IS 16601:2016 -</b> Guidelines for Digital Representation of Engineering Drawings.		8 weeks	<b>IS 16601:2016 -</b> Guidelines for Digital Representation of Engineering Drawings.
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		<b>IS 962:1989 -</b> Code of			IS 962:1989 - Code
2	Architectural Drawing	Practice for Architectural and		0 1	of Practice for
3				8 weeks	Architectural and
		Building Drawings.			Building Drawings.
					ISO/IEC 25010 -
		ISO/IEC 25010 -			System and
		System and Software		<b>.</b> .	Software Ouality
4	Python Learning	Quality Requirements		8 weeks	Requirements and
		and Evaluation			Evaluation
		(SQuaRE).			(SQuaRE).
		IGUGOUEG			IS/ISO/IEC
		18/180/1EC			27001:2013 -
5	Information Security			8 weeks	Information
	·	Information Security			Security
		Management.			Management.
					IS 2645:2003 -
					Architectural
					Preservation and
			https://onlinecourses.sw		Conservation
6	History of Ancient	Swayam	ayam2.ac.in/ini25 ar01/	8 weeks	Standards.
	Architecture		preview		Guidelines from the
					ASI
					(Archaeological
					Survey of India).
					IS 3362:1977 -
	Bioclimatic Architecture	Swayam	https://onlinecourses.npt el.ac.in/noc25_ar06/prev iew	8 weeks	Thermal Insulation
					of Buildings.
					IS 875 (Part
					2):1987 -
7					Environmental
/					Considerations in
					Building Design.
					IS 3792:2022 -
					Energy-Efficient
					and Sustainable
					Buildings.
					IS 2526:1963 -
			https://onlinecourses.ppt	t 2 8 weeks	Specification for
					Acoustic Material
					Properties.
					IS 4954:1968 -
8	Acoustic materials and meta	Swavam	el.ac.in/noc25_me01/pre		Sound Insulation
Ũ	materials		view		Materials and
					Applications.
					18 13356:2000 -
					Standards for Noise
					Control in
MODTE					Buildings.
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9	Interior Design	Swayam	https://onlinecourses.npt el.ac.in/noc25_de11/pre view	4 to 6 weeks	IS 3312:1974 - Guidelines for Interior Finishes and Materials. IS 6343:1982 - Code of Practice for Interior Lighting. IS 1643:1977 - Guidelines for Furniture Dimensions in Interior Spaces.
10	E Course on Griha version 2019	Griha	https://www.grihaindia.o		
		Program Group : Civil	Engineering	1	l
1	Civil 3D	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01329 18493657251845528_sh ared/overview	3 hrs	An Introduction to Civil 3D and Its Interface
2	The Civil 3D Workspace	Infosys Springboard	TOC - The Civil 3D Workspace   Infosys Springboard	3 hrs	This course starts off with an overview of the interface of Civil 3D, showing you how Civil 3D applies settings and styles to automate object placement. Building on this knowledge, you will learn to create and edit surfaces, alignments, and profiles.
3	GPS Surveying	NPTEL -SWAYAM	https://onlinecourses.npt el.ac.in/noc25_ce31/pre view	4 WEEKS	The objective of the course is to provide optimal insights into land surveying using GPS (Global Positioning System). The course starts with an introduction to land surveying leading to GPS as the state-of- art for surveying of land.
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#### Course Code : 312022

4	Advanced Topics in Science and Technology of Concrete	NPTEL -SWAYAM	https://onlinecourses.npt el.ac.in/noc25_ce64/pre view	4 WEEKS	This edition of the Advanced Topics course focuses on the use of recycled concrete as aggregate in new concrete construction.
5	Design of Connections in Steel Structures	NPTEL -SWAYAM	https://onlinecourses.npt el.ac.in/noc25_ce65/pre view	4 WEEKS	The course "Design of Connections in Steel Structures" helps students understand the fundamental mechanism of how different types of connections behave and how the analysis and design process accounts for the same.
6	Land Building And Civil Works	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 272204612403222498_s hared/overview	8 min	Project Finance modeling using Microsoft Excel offers a comprehensive introduction to project finance modeling, focusing on infrastructure projects. Participants will learn to create financial models for the EBC Underground Parking Project, gaining skills in forecasting income statements, balance sheets, and cash flows. Through hands-on Excel- based exercises, they will explore feasibility analysis, debt modeling, and scenario analysis
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7	SketchUp - Beginners	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 208087630643211723_s hared/overview	3 hrs 10min	The SketchUp Beginners course offers a comprehensive introduction to 3D modeling using SketchUp, a powerful and intuitive software widely used by professionals in different fields. Starting with the basics, you'll learn about the software's tools and user- friendly interface. The course covers downloading and installing SketchUp and then progresses into exploring toolbars, tabs, and practical application through hands-on exercises, enabling you to create accurate and visually appealing 3D models.
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8	Project on Google SketchUp	Infosys Springboard	TOC - Project on Google SketchUp   Infosys Springboard	1 hr 29 min	The Project on Google SketchUp offers an immersive and transformative learning experience, guiding participants through the process of 3D modeling and visualization using Google SketchUp. The course begins with an introduction to the software's interface and basic tools. The Project on Google SketchUp offers an immersive and transformative learning experience, guiding participants through the process of 3D modeling and visualization using Google SketchUp. The course begins with an introduction to the software's interface and basic tools SketchUp.
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9	SketchUp Case Study - 3D Landscape Garden	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 208345624576011846_s hared/overview	3 hrs 15 min	Garden Design and Visualization course is ideal for individuals interested in landscape architecture and garden design. Participants will learn essential design principles, spatial arrangement, plant selection, and focal point creation. They will gain hands-on experience using V- ray tools for realistic visualization and rendering, enabling them to create stunning presentations of their landscape garden designs.					
10	SketchUp Case Study - Create a 3D AutoCAD Plan from 2D House	Infosys Springboard	TOC - SketchUp Case Study - Create a 3D AutoCAD Plan from 2D House   Infosys Springboard	2 hrs 4 min	This is a Case Study on SketchUp - Create a 3D AutoCAD Plan from 2D House					
	Pro	gramme Code : Chemic	al Engineering							
1	Effective Time Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	3 Hr 46 min	Certificate Course					
2	Stress Management at Workplace	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	2 Hr 53 min	Certificate Course					
3	Senior Professional in Human Resourcess : Safety and Health	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	1 Hr 8 min	Certificate Course					
4	Indian oil & Gas Sector	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	1 Hr 38 min	Certificate Course					
5	Fundamental of Information Security	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	3 Hr 24 min	Certificate Course					
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## SECOND YEAR EXIT COURSE ( Online )

6	Design Thinking	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	3 Hr 31 min	Certificate Course
7	Security Standards & Regulations	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	4 Hr 08 min	Certificate Course
8	Management & Leadership	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	1 Hr 45 min	Certificate Course
9	Material Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	3 Hr 21 min	Certificate Course
10	Risk Management Investement Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	5 Hr 44 min	Certificate Course
11	Financial Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	2 Hr 41 Min	Certificate Course
12	Quality Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	3Hr 51 Min	Certificate Course
13	Fundamental of Risk Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	4 Hr 21 Min	Certificate Course
14	Theories of Stratregic Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	7 Hr 18 Min	Certificate Course
15	Customer Relationship Management	Infosis Springboard	https://infyspringboard.o nwingspan.com/web/en/ page/home	5 Hr 18 Min	Certificate Course
	Pr	ogramme Code : Electr	ical Engineering		
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1 MSBTE	Internet of Things 101	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_2155362288 2521997000_shared/ove rview	8 hours 23 minutes	This course introduces you to the fundamental concepts of building an IoT Ecosystem, implementation of IoT use cases using DIY boards, application of various IoT elements, provides details on different IoT industry sectors, and insights on IoT implementation challenges. IoT is poised to be the World's most massive device market. The adoption of the same in the industry will save companies billions of dollars. It is a must for us to embrace IoT now!
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2	AutoCAD Case Study -	Infosys Springboard	https://infyspringboard.o	2 hours	In this course
	<b>Electrical Power Demand</b>		nwingspan.com/web/en/	3	"Project on
	Calculation		app/toc/lex_auth_01384	minutes	AutoCAD -
			558552015001057149_8		Demand
			nareu/overview		Calculation"
					learners will look
					into the realm of
					electrical
					engineering through
					AutoCAD. By
					practical project.
					learners will gain
					hands-on
					experience in
					demands for
					electrical systems.
					Through step-by-
					step guidance,
					learners will utilize
					accurate and
					detailed electrical
					schematics,
					incorporate load
					calculations, and
					with industry
					standards. This
					course empowers
					learners to
					understand the
					distribution and
					demand estimation,
					honing their skills
					in a real-world
					aspiring electrical
					engineer or a
					professional looking
					to refine expertise,
					this course equips
					knowledge to
					proficiently perform
					power demand
					calculations using
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MSBTE	AutoCAD Case Study - Power Distribution Layout for Commercial Kitchen	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 338739362201637145_s hared/overview	2 hours 8 minutes	AutoCAD Case Study - Power Distribution Layout for Commercial Kitchen offers an immersive and transformative learning experience, guiding participants through the process of designing power distribution layouts for commercial kitchens using AutoCAD. The course commences with an introduction to electrical load analysis and an overview of essential AutoCAD tools and features for electrical design.Participants will delve into equipment placement techniques, learning how to strategically position electrical devices and appliances for efficient power distribution. The course covers electrical circuit design, enabling participants to create organized and well- structured circuits to hand lead of
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					commercial kitchen equipmen Today, children around the world have access to laptops, desktops, and smartphones. Knowing that the future is becoming
4	Electronics Course	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01373 779399397376019/over view	1 hour 26 minutes	synonymous with technology, it has become more important that our young minds become active consumers, and contribute to technology in the right manner, instead of staying mere passive users. In this course, we'll learn the most important electrical engineering concepts
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5	Assembling and Cabling	Infosys Springboard	https://infyspringboard.o 2 hours	The one and only
	Devices		nwingspan.com/web/en/	energy source for
			app/toc/lex_auth_01384	our advanced
			/8625547/964855134_s	civilization is
			hared/overview	electricity which is
				carried to every
				requirement via the
				cables. With the
				increase of
				electrical appliances
				in the domestic and
				commercial world,
				the volume of
			Y	cables has increased
				manifold. It has
				necessary to
				understand and
				manage the volume
				properly to avoid
				accidents and
				assembling crisis at
				the time of
				Moreover the type
				of cables varies as
				per the source of
				power and device
				which they are
				connected to.
				in all types of
				electrical devices
				for proper power
				distribution and also
				for communication
				purpose. In fact in
				the case of the
				like computers the
				cables are aptly
				designed as per the
				requirement of the
				parts they are
				connected with. The
				insulation and
				the material used
				for conduction. are
				chosen with great
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					care to serve the purpose. Other than the material, the ports which connect with the hardware should be recognized as they vary in connecting points and degree of power delivery. <b>The project "Solar Electric Power</b>
6	AutoCAD Case Study - Solar Electric Panel Design	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 206370179481611614_s hared/overview	1 hour 35 minutes	System Design" provides an introduction to designing a solar electric power system. It covers the design of solar electric panels using AutoCAD, including the layout and positioning of panels for optimal energy generation. The project also focuses on designing the power generation cable system to efficiently transmit the generated electricity. Additionally, learners will learn how to calculate the battery capacity needed to store the solar- generated power effectively
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		https://infyspringboard.o		
		nwingspan.com/web/en/		
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		erview		
	ELECTRICITY		1 hour	
7			58	
			minutes	
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8	AutoCAD Case Study - Fire Alarm System Layout		https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 339122647859238065_s hared/overview	3 hour 8 minutes	"AutoCAD Project - Fire Alarm System Layout" is a practical course that immerses learners in designing fire alarm system layouts using AutoCAD, a powerful computer- aided design software. This course likely covers aspects such as understanding fire safety regulations, creating accurate floor plans, placing fire alarm devices, and integrating symbols and annotations. Participants will learn how to translate fire safety requirements into detailed and precise AutoCAD drawings. Through hands-on exercises and real-world scenarios, this course empowers learners to master the art of designing effective fire alarm system layouts, making it a valuable resource for architects, engineers, and professionals in the field of building safety and design
	1	Program Group: Ele	ctronics		
1	ESim - EDA tool for circuit design, simulation, analysis and PCB design	SWAYAM , AICTE sponsored	https://onlinecourses.sw ayam2.ac.in/aic20_sp59/ preview	4 week	self-learn eSim - EDA tool is used for circuit design, simulation, analysis and PCB design
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# SECOND YEAR EXIT COURSE ( Online )

2	Python for Data Science-	SWAYAM , AICTE sponsored	https://onlinecourses.npt el.ac.in/noc25_cs60/prev iew	4 weeks	python programming for solving data science problems.
3	Electronic & Electrical Devices Maintenance&Troubleshooting	Udemy Online courses	https://www.udemy.com /course/electronic- electronics- maintenance-electronic- devices-maintenance/? srsltid=AfmBOop0wgN f9R5kWcZUA7pf5Vb7 TPYx9xjSL- LR1zqc9pMsX981xn7A &couponCode=ACCAG E0923	4 weeks	Understand the basic concepts of voltage, resistance and current, use of DMM and tools, Practical Troubleshooting and Maintenance of Electronic Devices
4	Python Programming - Comprehensive Training	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01384 17419204935682483_sh ared/overview	4 weeks	It covers essential concepts such as syntax, list, string, loops, files, GUI. Students will be able to build their own System programs, and basic malware testing programs.
5	Internet of Things 201	Infosys Springboard	https://infyspringboard.o nwingspan.com/web/en/ app/toc/lex_auth_01295 63012988354561318_sh ared/overview	4 weeks	This course provides practical insights about Raspberry Pi DIY Boards to create IoT usecases and IoT PoCs.
6	Arduino Robotics Part-I	https://easyshiksha.com/ online_courses	https://easyshiksha.com/ online_courses/arduino- robotics-part-i	4 weeks	introduction to the exciting field of robotics and to gain practical experience in building and programming robots.
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2 MSBTE	GD & T	AICTE	https://neat.aicte- india.org/course- details/NEAT2020616_P ROD_3	5 Hr	This course will provide students with the knowledge and skills to interpret, apply, and analyze Geometric Dimensioning and Tolerancing (GD&T) standards used in engineering design and manufacturing.
1	Robot Design and Developemnet	AICTE	https://neat.aicte- india.org/course- details/NEAT20221206_ PROD_1	5 Hr	This course will help student to equip swith the fundamental skills and practical knowledge required to control robots and its part for real- world applications.
	Prog	ramme Group-Mechani	cal Engineering	•	
8	Certificate Course in Internet of Things (IoT)	National Institute of Electronics & Information Technology,Kohima,	https://nielit.gov.in/kohi ma/content/short-term- courses-22	4 weeks	Introduction to IOT & embedded system, Projects using Arduino Uno and ESP-32:
7	Microcontroller Embedded C Programming: Absolute Beginners	https://easyshiksha.com/ online_courses/	https://easyshiksha.com/ online_courses/microco ntroller-embedded-c- programming-absolute- Beginners	4 weeks	This course provides a 'hardware-free' introduction to embedded software for students who: ? Already know how to write software for 'desktop' computer systems. ? Are familiar with a C-based language (Java, C++ or C). ? Want to learn how C is used in practical embedded systems.

3	CAD using Autodesk Inventor	AICTE	https://neat.aicte- india.org/course- details/NEAT2020621_P ROD_1	5 Hr	This course will enable students to create, modify, analyze, and optimize engineering designs using industry- standard CAD software, preparing them for roles in design and manufacturing.	
4	Fundamentals of Fixture Designing Concepts for CNC Machining Application	AICTE	https://neat.aicte- india.org/b2b-course- details/NEAT2020616_P ROD_9	5 Hr	Fixture design is a vital part of New Product development cycle. To design and manufacturing the fixture need a lot of skillset and in-depth understanding of CNC machining process and Locating / Clamping Principles.	
5	Electrical Vehicle engineering	AICTE	https://neat.aicte- india.org/course- details/NEAT2020627_P ROD_1	5 Hr	The electrical vehicle certification course is a Workshop Integrated Learning Program designed for students or professionals aspire to work or working in automotive, auto- component, design and manufacturing sector and aim to develop the required skills to build and sustain future automobiles. The program has a special emphasis on concepts such as Vehicle dynamics,	
Programme - Diploma in Hotel Management and Catering Technology						
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1	Food & Beverage Management	Università Bocconi	https://www.coursera.or g/learn/food-beverage- management	13 hours	The objective of this course is twofold: first, it will focus on contemporary challenges that managers and entrepreneurs in food and beverage businesses should be able to face; and second, will provide models and tools to design and implement appropriate courses of action to satisfy customers and build an advantage over the competition. This course is made up of four modules and an introduction, each exploring one dilemma that food and beverage companies face.	
2	Bar and Beverage Service Paid 1499	G O BPO Services Private Limited	https://www.skillindiadi gital.gov.in/courses/detai l/aa9e320a-729b-44a7- 9899-af61d8b75cbb	27 Hours	This course provides essential training in bar and beverage service. It includes bar opening procedures, equipment cleaning, and setting up the bar. Students will learn to prepare and serve juices, shakes, and alcoholic beverages, including handling wine and beer service. The course also covers managing intoxicated guests and maintaining a professional bar environment.	
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3	Digital Marketing Strategy	Institution:EdinburghX	https://www.edx.org/lear n/digital-marketing/the- university-of-edinburgh- digital-marketing- strategy	08 Weeks	Digital marketing is a major component of marketing today. This course will equip you with practical digital marketing skills to help you build your business. You will learn about the digital marketing landscape and how digital technologies can be used to help businesses identify opportunities and minimize risk. Case
4	Counter Sales Executive - Tourism & Hospitality	Tourism & Hospitality Skill Council	https://www.skillindiadi gital.gov.in/courses/detai l/91f96304-4601-4568- 84ec-4a994d2eb6f5	07 Hrs.	studies will be used to demonstrate how digital supports business objectives, and how it can set enterprise apart. The individual at work receives guests, answers their queries, takes down their orders, handle online food and beverage orders, transfers orders to the kitchen, instructs the kitchen staff, serves guests, ensures timely delivery of the order to the customer and maintains the QSR as per organizational policy.
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5	Front Desk and Telephone Operations (Paid 1499/-)	G O BPO Services Private Limited	https://www.skillindiadi gital.gov.in/courses/detai l/1c311296-a77f-4c7c- 8360-9a0bfd25958c	20 Hrs.	Training in reception and front office executive. Under Reception Duties we would cover areas like Pre- shift briefings. Efficiently handle reservations, check- ins, room changes, and guest records. Manage room extensions, group check-ins, and VIP servic	
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