Maharashtra State Board Of Technical Education, Mumbai

Learning and Assessment Scheme for Post S.S.C Diploma Courses

Programme Name	**: Diploma In Computer Technology / Computer Engineering / Computer Science & Engineering / Computer Science**		
Programme Code	**: CM / CO / CW / SE**	**With Effect From Academic Year**	**: 2023-24**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 16 WEEKS**
Semester	**: Fourth** **NCrF Entry Level : 3.5**	**Scheme**	**: K**

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											
						Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																	Practical						
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
(All Compulsory)																							
1	ENVIRONMENTAL EDUCATION AND SUSTAINABILITY	EES	VEC	314301	2	3	-	-	1	4	2	1.5	30	70*#	100	40	-	-	-	-	25	10	125
2	JAVA PROGRAMMING	JPR	AEC	314317	-	4	-	4	2	10	5	3	30	70	100	40	25	10	50#	20	25	10	200
3	DATA COMMUNICATION AND COMPUTER NETWORK	DCN	DSC	314318	-	3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175
4	MICROPROCESSOR PROGRAMMING	MIC	DSC	314321	-	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
5	PYTHON PROGRAMMING	PWP	AEC	314004	-	2	-	4	-	6	3	-	-	-	-	-	50	20	50#	20	-	-	100
6	UI/UX DESIGN	UID	SEC	314005	-	1	-	4	1	6	3	-	-	-	-	-	25	10	25@	10	25	10	75
Total					**2**	**16**		**18**	**6**		**20**		**120**	**280**	**400**		**150**		**175**		**125**		**850**

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./ 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./ Electronics Engineering/ Food Technology/ Computer Hardware & Maintenance/ 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/ Medical Electronics/ 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/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ ML/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX**
Semester	**: Fourth**
Course Title	**: ENVIRONMENTAL EDUCATION AND SUSTAINABILITY**
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.

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

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											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	-	-	-	-	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

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.

ENVIRONMENTAL EDUCATION AND SUSTAINABILITY **Course Code : 314301**

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	**Unit - III Ecosystem and Biodiversity** 3.1 Ecosystem - Definition, Aspects of ecosystem, Division of ecosystem, General characteristics of ecosystem, Functions of ecosystem 3.2 Biodiversity - Definitions, Levels, Value, and loss of biodiversity 3.3 Biodiversity Assessment Initiatives in India 3.4 SWOT analysis of biodiversity hot spot in India 3.5 Conservations of biodiversity - objects, and laws for conservation of biodiversity	Lecture Using Chalk-Board Presentations Video Demonstrations

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	**Unit - IV Environmental Pollution** 4.1 Definition of pollution, types- Natural & Artificial (Man- made) 4.2 Soil / Land Pollution – Need of preservation of soil resource, Causes and effects on environment and lives, preventive measures, Soil conservation 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 4.4 Air pollution - Causes, effects, prevention, CPCB norms of ambient air quality in residential area 4.5 Noise pollution - Sources, effects, prevention, noise levels at various zones of the city 4.6 Pollution Control Boards at Central and State Government level: Norms, Roles and Responsibilities	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

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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

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

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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 sustainabilityand 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

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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

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	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

ENVIRONMENTAL EDUCATION AND SUSTAINABILITY **Course Code : 314301**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	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			
CO3	-	-	-	-	3	1	2			
CO4	1	-	-	-	3	2	2			
CO5	1	-	2	-	3	2	3			

Legends :- High:03, Medium:02,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	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

ENVIRONMENTAL 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/11803Official-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/sustainable-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-analysis-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

Programme Name/s	: 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./ 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/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer 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/ MU/ PG/ PN/ PO/ SE/ TC/ TE/ TR/ TX
Semester	: Third
Course Title	: ESSENCE OF INDIAN CONSTITUTION
Course Code	: 313002

I. RATIONALE

This course will focus on the basic structure and operative dimensions of Indian Constitution. It will explore various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian Constitution. The Constitution of India is the supreme law of India. The document lays down the framework demarcating the fundamental political code, structure, procedures, powers, and sets out fundamental rights, directive principles, and the duties of citizens. The course on constitution of India highlights key features of Indian Constitution that makes the students a responsible citizen. In this online course, we shall make an effort to understand the history of our constitution, the Constituent Assembly, the drafting of the constitution, the preamble of the constitution that defines the destination that we want to reach through our constitution, the fundamental right constitution guarantees through the great rights revolution, the relationship between fundamental rights and fundamental duties, the futurist goals of the constitution as incorporated in directive principles and the relationship between fundamental rights and directive principles.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry /employer expected outcome – Abide by the Constitution in their personal and professional life.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - List salient features and characteristics of the constitution of India.
- CO2 - Follow fundamental rights and duties as responsible citizen of the country.
- CO3 - Analyze major constitutional amendments in the constitution.
- CO4 - Follow procedure to cast vote using voter-id.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA			
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min		
313002	ESSENCE OF INDIAN CONSTITUTION	EIC	VEC	1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	50	20	50	

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

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Note :

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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 Explain the meaning of preamble of the constitution. TLO 1.2 Explain the doctrine of basic structure of the constitution. TLO 1.3 List the salient features of constitution. TLO 1.4 List the characteristics of constitution.	**Unit - I Constitution and Preamble** 1.1 Meaning of the constitution of India. 1.2 Historical perspectives of the Constitution of India. 1.3 Salient features and characteristics of the Constitution of India. 1.4 Preamble of the Constitution of India.	Presentations Blogs Hand-outs Modules Flipped classrooms Case studies

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 Enlist the fundamental rights. TLO 2.2 . Identify fundamental duties in general and in particular with engineering field. TLO 2.3 Identify situations where directive principles prevail over fundamental rights.	**Unit - II Fundamental Rights and Directive Principles** 2.1 Fundamental Rights under Part-III. 2.2 Fundamental duties and their significance under part-IV-A. 2.3 Relevance of Directive Principles of State Policy under part-IV A.	Presentations Blogs Hand-outs Modules Case Study Flipped Classroom
3	TLO 3.1 Enlist the constitutional amendments. TLO 3.2 Elaborate the elements of Centre-State Relationship TLO 3.3 Analyze the purposes of various amendments.	**Unit - III Governance and Amendments** 3.1 3.1 Amendment procedure of the Constitution and their types - simple and special procedures. 3.2 The Principle of Federalism and its contemporary significance along with special committees that were setup. 3.3 Major Constitutional Amendment procedure - 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, 102nd	Cases of Federal disputes with relevant Supreme court powers and Judgements Presentations Blogs Hand-outs Problem based learning
4	TLO 4.1 Explain the importance of electoral rights. TLO 4.2 Write the step by step procedure for process of registration TLO 4.3 Explain the significance of Ethical electoral participation TLO 4.4 Explain the steps to motivation and facilitation for electoral participation TLO 4.5 Enlist the features of the voter's guide TLO 4.6 Explain the role of empowered voter TLO 4.7 Write the steps of voting procedure TLO 4.8 Write steps to create voter awareness TLO 4.9 Fill the online voter registration form TLO TLO 4.10 Follow procedure to cast vote using voter-id.	**Unit - IV Electoral Literacy and Voter's Education** 4.1 Electoral rights , Electoral process of registration 4.2 Ethical electoral participation 4.3 Motivation and facilitation for electoral participation 4.4 Voter's guide 4.5 Prospective empowered voter 4.6 Voting procedure 4.7 Voter awareness 4.8 Voter online registration https:/ /www.ceodelhi.gov.in/ELCdetails.aspx	Presentations Hand-outs Modules Blogs Problem based Learning

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

- Outline the procedure to submit application for Voter-id
- Assignments are to be provided by the course teacher in line with the targeted COs.

A1. Prepare an essay on Constitution of India .
A2 Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA

- Assignments are to be provided by the course teacher in line with the targeted COs. A1. Prepare an essay on Constitution of India . A2 Prepare a comparative chart of Unique features of Indian Constitution of India and Constitution of USA A3. Self-learning topics: Parts of the constitution and a brief discussion of each part Right to education and girl enrollment in schools. GER of Girls and Boys. Right to equality. Social Democracy. Women Representation in Parliament and State Assemblies. LGBTQIA+

Micro project

- 1. Organize a workshop-cum discussions for spreading awareness regarding Fundamental Rights of the citizen of the country

2. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgements.
3. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

Seminar

- 1 Differences in the ideals of Social democracy and Political democracy.

2 Democracy and Women's Political Participation in India.
3 Khap Panchayat - an unconstitutional institution infringing upon Constitutional ethos.
4 Situations where directive principles prevail over fundamental rights.

Group discussions on current print articles.

-

- Art 356 and its working in Post-Independent India.
- Women's Resrvation in Panchayat leading to Pati Panchayats - Problems and Solutions.
- Adoption of Article 365 in India.
- Need of Amendments in the constitution.
- Is India moving towards a Unitary State Model ?

Activity

- Arrange Mock Parliament debates.

Prepare collage/posters on current constitutional issues.
i. National (Art 352) & State Emergencies (Art 356) declared in India.
ii. Seven fundamental rights.
iii. Land Reforms and its effectiveness - Case study of West-Bengal and Kerala.

Cases: Suggestive cases for usage in teaching:

- A.K. Gopalan Case (1950) :SC contented that there was no violation of Fundamental Rights enshrined in Articles 13, 19, 21 and 22 under the provisions of the Preventive Detention Act, if the detention was as per the procedure established by law. Here, the SC took a narrow view of Article 21.

Shankari Prasad Case (1951) : This case dealt with the amendability of Fundamental Rights (the First Amendment's validity was challenged). The SC contended that the Parliament's power to amend under Article 368 also includes the power to amend the Fundamental Rights guaranteed in Part III of the Constitution.
Minerva Mills case (1980) :This case again strengthens the Basic Structure doctrine. The judgement struck down 2 changes made to the Constitution by the 42nd Amendment Act 1976, declaring them to violate the basic structure. The judgement makes it clear that the Constitution, and not the Parliament is supreme.
Maneka Gandhi case (1978) :A main issue in this case was whether the right to go abroad is a part of the Right to Personal Liberty under Article 21. The SC held that it is included in the Right to Personal Liberty. The SC also ruled that the mere existence of an enabling law was not enough to restrain personal liberty. Such a law must also be "just, fair and reasonable."
Other cases:
1. Kesavananda Bharati Case (1973) : In this case the Hon. SC laid down a new doctrine of the 'basic structure' (or 'basic features') of the Constitution. It ruled that the constituent power of Parliament under Article 368 does not enable it to alter the 'basic structure' of the Constitution. This means that the Parliament cannot abridge or take away a Fundamental Right that forms a part of the 'basic structure' of the Constitution.
2. Mathura Rape Case(1979) : A tribal woman Mathura (aged 14 to 16 years) was raped in Police Custody. The case raised the questions on the idea of 'Modesty of Woman' and here it was was a tribal woman who succumbs to multiple pattiarchies. Custodial rape was made an offence and was culpable with the detainment of 7 years or more under Section 376 of Indian Penal Code. The weight of proofing the allegations moved from the victim to the offender, once sexual intercourse is established. The publication of the victim's identity was banned and it was also held that rape trials should be conducted under the cameras.
3. Puttswamy vs Union of India (2017) : In this landmark case which was finally pronounced by a 9-judge bench of the Supreme Court on 24th August 2017, upholding the fundamental right to privacy emanating from Article 21. The court stated that Right to Privacy is an inherent and integral part of Part III of the Constitution that guarantees fundamental rights. The conflict in this area mainly arises between an individual's right to privacy and the legitimate aim of the government to implement its policies and a balance needs to be maintained while doing the same.
4. Navtej Singh Johar & Ors. v. Union of India (2018) : Hon. SC Decriminalised all consensual sex among adults, including homosexual sex by scrapping down section 377 of the Indian penal code (IPC). The court ruled that LGBTQ community are equal citizens and underlined that there cannot be discrimination in law based on sexual orientation and gender.
5. Anuradha Bhasin Judgement (2020) : The Supreme Court of India ruled that an indefinite suspension of internet services would be illegal under Indian law and that orders for internet shutdown must satisfy the tests of necessity and proportionality. The Court reiterated that freedom of expression online enjoyed Constitutional protection, but could be restricted in the name of national security. The Court held that though the Government was empowered to impose a complete internet shutdown, any order(s) imposing such restrictions had to be made public and was subject to judicial review.

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 : NOT

APPLICABLE

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	I	Constitution and Preamble	CO1	4	0	0	0	0
2	II	Fundamental Rights and Directive Principles	CO2	4	0	0	0	0
3	III	Governance and Amendments	CO3	4	0	0	0	0
4	IV	Electoral Literacy and Voter's Education	CO4	3	0	0	0	0
Grand Total				**15**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Assignment, Self-learning and Terms work Seminar/Presentation

Summative Assessment (Assessment of Learning)

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	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	-	-	-	2	-	-			
CO2	1	-	-	-	2	-	-			
CO3	1	2	-	-	2	-	1			
CO4	-	-	-	1	-	-	-			

Legends :- High:03, Medium:02,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	P.M.Bakshi	The Constitution of India	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105 (Check the new edition)

ESSENCE OF INDIAN CONSTITUTION **Course Code : 313002**

Sr.No	Author	Title	Publisher with ISBN Number
2	D.D.Basu	Introduction to Indian Constitution	Lexis Nexis Publisher, New Delhi, 2015, ISBN:935143446X
3	B. K. Sharma	Introduction to Constitution of India	PHI, New Delhi, 6thedition, 2011, ISBN:8120344197
4	MORE READS :	Oxford Short Introductions - The Indian Constitution by Madhav Khosla. The Indian Constitution: Cornerstone of a Nation by Granville Austin. Working a Democratic Constitution: A History by Garnville Austin Founding Mothers of the Indian Republic: Gender Politics of the Framing of the Constitution by Achyut Chetan. Our Parliament by Subhash C. Kashyap. Our Political System by Subhash C. Kashyap. Our Constitution by Subhash C. Kashyap. Indian Constitutional Law by Rumi Pal.	Extra Read
5	B.L. Fadia	The Constitution of India	Sahitya Bhawan,Agra, 2017, ISBN:8193413768

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.legislative.gov.in/constitution-of-india	Constitution overview
2	https://en.wikipedia.org/wiki/Constitution_of_India	Parts of constitution
3	https://www.india.gov.in/my-government/constitution-india	Constitution overview
4	https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/	Fundamental rights and duties
5	https://main.sci.gov.in/constitution	Directive principles
6	https://legalaffairs.gov.in/sites/default/files/chapter%203.pdf	Parts of constitution
7	https://www.concourt.am/armenian/legal_resources/world_constitutions/constit/india/india-e.htm	Parts of constitution
8	https://constitutionnet.org/vl/item/basic-structure-indian-constitution	Parts of constitution

Note :

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

PYTHON PROGRAMMING **Course Code : 314004**

Programme Name/s	**: Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology/ Computer Science/**
Programme Code	**: BD/ CM/ CO/ CW/ HA/ IF/ IH/ SE**
Semester	**: Fourth**
Course Title	**: PYTHON PROGRAMMING**
Course Code	**: 314004**

I. RATIONALE

Python is an open source, general-purpose and most versatile programming language. Python code is simple, readable, short, intuitive, and powerful, and thus it is effective for introducing computing and problem solving for beginners. This course covers basic fundamentals of Python programming, which also provides a foundation for further exploration of its more advanced applications in a variety of domains, including application development, data science, artificial intelligence, machine learning, and more.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Develop applications using python to solve given problem.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Develop python programs using control flow statements.
- CO2 - Perform operations on various data structures in Python.
- CO3 - Develop packages to solve given problem using python.
- CO4 - Apply object-oriented approach to solve given problem using python.
- CO5 - Use relevant built-in python package to develop application.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314004	PYTHON PROGRAMMING	PWP	AEC	2	-	4	-	6	3	-	-	-	-	-	50	20	50#	20	-	-	100

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 Explain given feature of python. TLO 1.2 Write python program to perform basic input output operations. TLO 1.3 Write python program to solve given expression. TLO 1.4 Implement given decision making statements and looping statements in python program.	**Unit - I Introduction to Python and Control flow statements** 1.1 Introduction: Features, History and Applications of Python, Python IDE’s 1.2 Python building blocks: Indentation, Identifiers, Variable, Comments, Keywords 1.3 Basic input output operations: input(), print() 1.4 Operators: Arithmetic, Relational, Assignment, Logical, Bitwise, Membership and Identity operator 1.5 Control flow statements: Conditional statements (if, if-else, if-elif-else, nested if), Loops in python (while, for, nested loops), Loop manipulation statements (continue, pass, break, else)	Chalk-Board Demonstration Presentations

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 Write python program to manipulate lists. TLO 2.2 Write python program to manipulate tuples. TLO 2.3 Write python program to manipulate sets. TLO 2.4 Write python program to manipulate dictionaries.	**Unit - II Data Structures in Python** 2.1 List: a) Defining lists, accessing values from list, deleting list values, updating lists b) Basic list operations c) Built-in list functions/methods 2.2 Tuple: a) Defining Tuple, accessing values from Tuple b) Basic Tuple operations c) Built in Tuple functions/methods 2.3 Set: a) Defining Sets, accessing values from set, deleting set values b) Basic set operations c) Built in set functions/methods 2.4 Dictionary: a) Defining Dictionary, accessing values from Dictionary, deleting Dictionary values, updating Dictionary b) Basic Dictionary operations c) Built in Dictionary functions/methods	Chalk-Board Demonstration Presentations Hands-on
3	TLO 3.1 Write relevant user defined functions for the given problem. TLO 3.2 Write relevant user defined module for the given problem. TLO 3.3 Write packages for the given problem.	**Unit - III Functions, Modules and Packages in Python** 3.1 Functions: Defining function, Calling function, Function arguments, Return statement, Scope of Variable, Lambda functions 3.2 Modules: Create user defined Module, Importing a module, Using python built-in modules, Namespace and scoping 3.3 Python Packages: Create user defined Package, Importing a Package, Using python built-in Packages, Installing packages using PIP	Chalk-Board Demonstration Presentations Hands-on
4	TLO 4.1 Write python program using classes and objects to solve given problem. TLO 4.2 Implement python program using different types of constructors. TLO 4.3 Write program to demonstrate polymorphism. TLO 4.4 Write python code using data abstraction for given problem. TLO 4.5 Apply inheritance for the given problem.	**Unit - IV Object Oriented Programming in Python** 4.1 Object oriented Concepts: Creating class, Creating object 4.2 Constructors in python (Parameterized & Non-Parameterized), the self parameter 4.3 Polymorphism: Method Overloading and Overriding 4.4 Data Hiding / Abstraction 4.5 Inheritance: Single Inheritance, Multiple Inheritance, Multilevel Inheritance	Chalk-Board Demonstration Presentations Hands-on

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 Write python program to use pandas package for the given problem. TLO 5.2 Create GUI application using tkinter package for the given problem. TLO 5.3 Create a python application to connect with database.	**Unit - V Introduction to Built-in Packages in Python** 5.1 Pandas: Use of pandas, pandas series, pandas DataFrames, pandas Read CSV 5.2 Creating GUI using tkinter: Introduction to tkinter, Widgets (Entry, Label, Button, RadioButton, Checkbutton), Creating a simple GUI application 5.3 Connecting to Database using MySQL: Installing mysql-connector, cursor() object, execute() method, fetchall() method, Creating simple program to connect database	Lecture Using Chalk-Board Flipped Classroom Demonstration Presentations

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 Install the given Python IDE.	1	Install given Python IDE.	2	CO1
LLO 2.1 Write python program for performing basic input and output operation in given problem.	2	*1. Write python program to display welcome message on screen. 2. Implement the python program to read data from user and display data on screen.	2	CO1
LLO 3.1 Write python program to solve given expression.	3	*Implement a python programs using following operators: 1. Arithmetic 2. Relational & logical 3. Assignment 4. Bitwise 5. Membership 6. Identity	2	CO1
LLO 4.1 Write python program for solving given problem using various if statements.	4	*Implement a python program to demonstrate the use of following conditional statements: 1. if statement 2. if..else statement 3. if..elif..else statement 4. nested if statement	2	CO1
LLO 5.1 Write python program for solving given problems using a while loop. LLO 5.2 Write python program for solving given problem using for loop.	5	*Implement a python program to demonstrate the use of following looping statements: 1. while loop 2. for loop 3. nested loop	2	CO1
LLO 6.1 Use loop control statements in python for solving given problem.	6	Implement python program to demonstrate the use of loop control statements. [continue, pass, break, else]	2	CO1

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Write python program to perform operations on list.	7	*Implement a python program to perform following operations on the List: 1. Create a List 2. Access List 3. Update List 4. Delete List	2	CO2
LLO 8.1 Write python program to use built-in functions on list.	8	Implement Python program to demonstrate the use of built-in functions/methods on List (Any Eight Functions/methods)	2	CO2
LLO 9.1 Write python program to perform operations on tuple.	9	*Implement python program to perform following operations on the Tuple: 1. Create a Tuple 2. Access Tuple 3. Print Tuple 4. Delete Tuple 5. Convert tuple into list and vice-versa	2	CO2
LLO 10.1 Write python program to manipulate the set.	10	*Implement a python program to perform following operations on the Set: 1. Create a Set 2. Access Set 3. Update Set 4. Delete Set	2	CO2
LLO 11.1 Use built-in functions/methods on sets in python for solving given problems.	11	Implement a python program to perform following functions on Set: 1. Union 2. Intersection 3. Difference 4. Symmetric Difference	2	CO2
LLO 12.1 Write python program to perform operations on dictionary.	12	*Implement a python program to perform following operations on the Dictionary: 1. Create a Dictionary 2. Access Dictionary 3. Update Dictionary 4. Delete Dictionary 5. Looping through Dictionary 6. Create Dictionary from list	2	CO2
LLO 13.1 Write function to solve given problem.	13	Write a user define function to implement following features: 1. Function without argument 2. Function with argument 3. Function returning value	2	CO3
LLO 14.1 Write python program to create function by selecting appropriate type of argument.	14	*Implement user defined function for given problem: 1. Function positional/required argument 2. Function with keyword argument 3. Function with default argument 4. Function with variable length argument	2	CO3

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Write python program using anonymous function. LLO 15.2 Write python program to use function in argument.	15	Write Python program to demonstrate use of following advanced functions: 1. lambda 2. map 3. reduce	2	CO3
LLO 16.1 Write user defined module to solve given problem.	16	Write a python program to create and use a user defined module for a given problem.	2	CO3
LLO 17.1 Select appropriate module to solve given problem. LLO 17.2 Use given module to solve problem.	17	Write a python program to demonstrate the use of following module: 1. math module 2. random module 3. os module	2	CO3
LLO 18.1 Write user defined package to solve given problem.	18	*Write python program to create and use a user defined package for a given problem.	2	CO3
LLO 19.1 Use numpy and matplotlib package to solve given problem. LLO 19.2 Select appropriate methods from numpy and matplotlib package to solve given problem.	19	Write a python program to use of numpy package to perform operation on 2D matrix. Write a python program to use of matplotlib package to represent data in graphical form.	2	CO4
LLO 20.1 Write python program using classes and objects to solve a given problem.	20	*Develop a python program to perform following operations: 1. Creating a Class with method 2. Creating Objects of class 3. Accessing method using object	2	CO4
LLO 21.1 Write a python program to initialize objects of class using various types of constructors.	21	*Write a python program to demonstrate the use of constructors: 1. Default 2. Parameterized 3. Constructor Overloading	2	CO4
LLO 22.1 Write a python program to implement polymorphism.	22	*Implement a python program to demonstrate 1. Method Overloading 2. Method Overriding	2	CO4
LLO 23.1 Write a python program to use data hiding concept in python.	23	Write python program to demonstrate data hiding.	2	CO4
LLO 24.1 Select appropriate type of inheritance to solve given problem. LLO 24.2 Write python program using inheritance to solve given problem.	24	*Write a python program to implement 1. Single inheritance 2. Multiple Inheritance 3. Multilevel inheritance	2	CO4
LLO 25.1 Use panda package and its appropriate functions/methods to solve a given problem.	25	*Implement Python program to perform following operations using panda package: 1. Create Series from Array 2. Create Series from List 3. Access element of series 4. Create DataFrame using List or dictionary	2	CO5
LLO 26.1 Write python program to read CSV file using the panda package.	26	Implement python program to load a CSV file into a Pandas DataFrame and perform operations.	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 27.1 Use appropriate packages in a python program to create GUI applications.	27	*Write python GUI program to import Tkinter package and create a window and set its title.	2	CO5
LLO 28.1 Write python program to create GUI based python applications using appropriate python packages.	28	Write python GUI program that adds labels and buttons to the Tkinter window.	2	CO5
LLO 29.1 Write python program to connect database.	29	Write program to create a connection between database and python.	2	CO5
LLO 30.1 Write python program to display the content from database.	30	Implement python program to select records from the database table and display the result.	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)

Activities

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the Virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, online coding contests on websites like hackerrank, Codechef etc.
- At the institution level, encourage students to start a coding club.

Self Learning

- Students are encouraged to register themselves in various MOOC's such as Infosys Springboard, Swayam etc. to further enhance their learning.

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

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Any Database Software	29,30
2	Computer System (Any computer system with basic configuration)	All
3	Python Interpreter / IDE (Any open source python distribution such as anaconda etc) (Any open source IDE such IDLE, Jupyter Notebook, Spyder, PyCharm etc)	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	I	Introduction to Python and Control flow statements	CO1	6	0	0	0	0
2	II	Data Structures in Python	CO2	8	0	0	0	0
3	III	Functions, Modules and Packages in Python	CO3	6	0	0	0	0
4	IV	Object Oriented Programming in Python	CO4	4	0	0	0	0
5	V	Introduction to Built-in Packages in Python	CO5	6	0	0	0	0
Grand Total				**30**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering 1) 60% weightage is to process 2) 40% weightage to product

Summative Assessment (Assessment of Learning)

- End Semester Examination, Lab Performance, Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	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	-	-	-			
CO2	2	1	1	1	-	-	-			

CO3	3	2	2	2	-	-	-			
CO4	3	3	3	2	-	-	1			
CO5	3	2	3	3	-	-	1			

Legends :- High:03, Medium:02,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	R. Nageswara Rao	Core Python Programming	Dreamtech Press, ISBN-13:9789390457151
2	Mark Lutz	Learning Python	O'Reilly Media, Inc, ISBN: 9781449355739
3	David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler	Python Basics	Real Python, ISBN-13: 9781775093329
4	Dr. Jeeva Jose	Taming Python by Programming	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN: 9789386173348
5	Rupesh Nasre	Python Programming	AICTE, ISBN 9788195986354 [Online available on AICTE e-Kumbh]

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://ekumbh.aicte-india.org/allbook.php	Python Programming
2	https://python-iitk.vlabs.ac.in/	Python Programming Lab
3	https://spoken-tutorial.org/watch/Python+3.4.3/Input-output/English/	Introduction to Python and control flow statements, Data Structures in Python, Function and module
4	https://onlinecourses.nptel.ac.in/noc19_cs41/preview	Python Programming Course
5	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013094439793500160259 2_shared/overview	Python for Beginners
6	https://www.geeksforgeeks.org/python-gui-tkinter/	Python GUI Programming
7	https://www.w3schools.com/python/python_mysql_getstarted.asp	Python MySQL Database Connectivity
8	https://www.tutorialspoint.com/python_pandas/index.htm	Python pandas package
9	https://www.programiz.com/python-programming/object-oriented -programming	OOP using Python

Note :

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

JAVA PROGRAMMING **Course Code : 314317**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Data Sciences/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology/ Computer Science/ Electronics & Computer Engg./**
Programme Code	**: AI/ AN/ BD/ CM/ CO/ CW/ DS/ HA/ IF/ IH/ SE/ TE**
Semester	**: Fourth**
Course Title	**: JAVA PROGRAMMING**
Course Code	**: 314317**

I. RATIONALE

Java is platform independent, open-source object-oriented programming language and used for web applications. Java has the broad industry support and is prerequisite with many allied technologies like Java Server Pages, Android Application Development. This course will enable students to develop applications using java.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Develop standalone and network-based applications using Java.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Develop java program using classes and objects.
- CO2 - Develop java program for implementing code reusability concept.
- CO3 - Develop program to implement multithreading and exception handling.
- CO4 - Develop java program for implementing event handling using window-based application components.
- CO5 - Implements network programming in java.
- CO6 - Develop java program for managing database.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314317	JAVA PROGRAMMING	JPR	AEC	4	-	4	2	10	5	3	30	70	100	40	25	10	50#	20	25	10	200

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 Write programs to create classes and objects for the given problem. TLO 1.2 Describe characteristics of the given java token. TLO 1.3 Write program to evaluate given expressions. TLO 1.4 Write programs using relevant control structure to solve the given problem. TLO 1.5 Develop programs using vectors and wrapper classes for the given problem. TLO 1.6 Use constructors for the given programming problem.	**Unit - I Basic Syntactical Constructs in Java** 1.1 Java features and the Java programming environment 1.2 Defining a class, creating object, accessing class members 1.3 Java tokens and data types, symbolic constant, scope of variable, typecasting, and different types of operators and expressions, decision making and looping statements 1.4 Arrays, strings, string buffer classes, vectors, wrapper classes 1.5 Constructors and methods, types of constructors, method and constructor overloading, nesting of methods, command line arguments, garbage collection, visibility control: public, private, protected, default, private protected	Chalk-Board Demonstration Flipped Classroom Presentations

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 Apply identified type of inheritance for the given programming problem. TLO 2.2 Differentiate between overloading and overriding with the help of examples. TLO 2.3 Develop program using interface. TLO 2.4 Create user defined package for the given problem.	**Unit - II Inheritance, Interface and Packages** 2.1 Inheritance: concept of inheritance , types of Inheritance: single inheritance, multilevel inheritance, hierarchical inheritance, method overriding, final variables, final methods, use of super, abstract methods and classes 2.2 Interfaces: Define interface, implementing interface, accessing interface variables and methods, extending interfaces 2.3 Package: Define package, types of package, naming and creating package, accessing package, import statement, static import, adding class and interfaces to a package	Lecture Using Chalk-Board Presentations Hands-on Flipped Classroom
3	TLO 3.1 Distinguish the errors and exceptions with example. TLO 3.2 Develop program for handling the given exception. TLO 3.3 Create threads to run multiple processes in a program. TLO 3.4 Develop program using different thread life cycle methods.	**Unit - III Exception Handling and Multithreading** 3.1 Errors and Exception: Types of errors and exceptions, try and catch statement, throws and finally statement, built-in exceptions, throwing our own exception 3.2 Multithreaded programming : creating a thread: By extending to thread class and by implementing runnable Interface, Life cycle of thread: Thread methods, thread exceptions, thread priority and methods, synchronization	Lecture Using Chalk-Board Presentations Flipped Classroom Hands-on
4	TLO 4.1 Write steps to develop Graphical User Interface (GUI) using AWT components with frame for the given problem. TLO 4.2 Develop program using menu and dialog boxes for the given problem. TLO 4.3 Write steps to develop Graphical user interface (GUI) using advanced swing components for the given problem. TLO 4.4 Use delegation event model to develop event driven program for the given problem. TLO 4.5 Use relevant AWT/ Swing component(s) to handle the given event.	**Unit - IV Event handling using Abstract Window Toolkit (AWT) & Swings Components** 4.1 Component, container, window, frame, panel, use of AWT controls: labels, buttons, checkbox, checkbox group, textfield, textarea 4.2 Use of layout managers: flowLayout, borderLayout, gridLayout, gridBagLayout, menubars, menus, file dialog 4.3 Introduction to swing: Swing features, difference between AWT and Swing. 4.4 Swing components: Icons and Labels, TextField, ComboBox, Button, Checkbox, RadioButton 4.5 Advanced Swing Components: Tabbed Panes, Scroll Panes, Trees, Tables, Progress bar, tool tips 4.6 Introduction to Event Handling: The delegation Event Model: Event sources, Event listeners 4.7 Event classes: The action event class, the Item event class, the Key event class, the mouse event class, text event 4.8 Event listener interfaces: ActionListener , ItemListener , KeyListener , MouseListener , MouseMotion , TextListener	Lecture Using Chalk-Board Presentations Demonstration Hands-on

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 Describe the concepts of sockets in java. TLO 5.2 Use networking classes to retrieve host details. TLO 5.3 Develop program for Client/Server communication through TCP/IP Server sockets for the given problem.	**Unit - V Basics of Network Programming** 5.1 Socket Overview: Client/Server , reserved Sockets , proxy servers , Internet Addressing 5.2 Java and the Net: The networking classes and interfaces, InetAddress : Factory Methods , Instance Methods 5.3 TCP/IP Client and Server Sockets, datagram sockets, datagram packets 5.4 The URL Class, URLConnection class	Lecture Using Chalk-Board Presentations Flipped Classroom Hands-on
6	TLO 6.1 Choose relevant database connectivity methods. TLO 6.2 Describe two tier and three tier architecture of JDBC. TLO 6.3 Choose relevant type of JDBC driver for the specified environment. TLO 6.4 Elaborate steps with example to establish connectivity with the specified database.	**Unit - VI Interacting with Database** 6.1 Introduction to JDBC, ODBC 6.2 JDBC architecture: Two tier and three tier models 6.3 Types of JDBC drivers, Class Class , DriverManager class, Connection interface, Statement interface, PreparedStatement interface, ResultSet Interface	Lecture Using Chalk-Board Presentations Flipped Classroom Hands-on

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 Install any IDE software application.	1	* Setup Java Programming development environment using: • Command prompt.(Classpath and path setup) • Any IDE (Eclipse, Netbeans, VScode, Jcreator etc.).	2	CO1
LLO 2.1 Implement programs to evaluate different types of Expressions.	2	Write programs to evaluate different types of expressions.	2	CO1
LLO 3.1 Develop program to implement different control structures.	3	Write programs to demonstrate use of: • if statements (all forms of if statement • Switch – Case statement • Different types of Loops(for,while and do..while).	2	CO1
LLO 4.1 Develop program to implement different control structures.	4	*Write programs for implementation of different methods of: • String class. • StringBuffer class.	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 5.1 Implement array and vectors in Java.	5	* Write programs to demonstrate: • Use of Array. • Use of Vectors .	2	CO1
LLO 6.1 Convert primitive data types into object and vice-versa.	6	Write programs using Wrapper Class : • to convert primitive into object. • to convert object into primitive.	2	CO1
LLO 7.1 Initialize objects using constructors.	7	Develop a program for implementation of different types of constructors.	2	CO1
LLO 8.1 Implement concepts of inheritance for code reusability.	8	Develop program to implement: • Single inheritance. • Multilevel inheritance.	2	CO2
LLO 9.1 Implement multiple inheritance.	9	* Develop program for implementation of interface.	2	CO2
LLO 10.1 Implement packages in Java.	10	*Write programs to demonstrate use of : • Built in packages • User defined packages.	2	CO2
LLO 11.1 Identify the different types of errors using exception handling.	11	Write programs for implementation of try, catch and finally block.	2	CO3
LLO 12.1 Manage different types of user defined exceptions.	12	*Write programs for implementation of throw, throws clause.	2	CO3
LLO 13.1 Execute different processes simultaneously using multithreading.	13	*Write programs using multithreading.	2	CO3
LLO 14.1 Design GUI using different AWT components.	14	* Write program to design any type of form using AWT components.	2	CO4
LLO 15.1 Design GUI using different menu class.	15	Write program to create a menu bar with various menu items and sub menu items.	2	CO4
LLO 16.1 Design GUI using border layout manager.	16	Write program to demonstrate the use of border layout. The layout shows four buttons at four sides with captions “left”, “right”, “top” and “bottom” using Swing Components.	2	CO4
LLO 17.1 Design GUI using grid layout manager.	17	*Write program to design a calculator to demonstrate the use of grid layout using swing components.	2	CO4
LLO 18.1 Implement swing components in a frame.	18	Write program using swing to display a JComboBox in a JFrame .	2	CO4
LLO 19.1 Design tree and table using advanced swing components in a frame.	19	Write program to create JTree and JTable.	2	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 20.1 Implement various keys and mouse events.	20	* Write program to handle key events and mouse events.	2	CO4
LLO 21.1 Implement action event in java.	21	*Write program to implement action event in frame using swing components.	2	CO4
LLO 22.1 Implement text event in java.	22	Write program to handle text event on swing components.	2	CO4
LLO 23.1 Extract the hostname and IP address using InetAddress class.	23	Write program to retrieve hostname and IP address using InetAddress class.	2	CO5
LLO 24.1 Retrieve various components of URL using different methods of URL and URLConnection class.	24	*Write program to demonstrate various methods of: • URL class. • URLConnection.	2	CO5
LLO 25.1 Implement client-server TCP based communication.	25	*Write program that demonstrates connection oriented communication using socket.	2	CO5
LLO 26.1 Implement client-server UDP based communication.	26	Write program to demonstrate sending and receiving data through datagram.	2	CO5
LLO 27.1 Make database connectivity using appropriate JDBC driver.	27	*Write program to: • Create sample database. • Make connectivity with database.	2	CO6
LLO 28.1 Manage database using JDBC.	28	*Write program to implement following operations on database: • Insert record. • Update record. • Delete record.	2	CO6
LLO 29.1 Manage database using JDBC.	29	Write program to demonstrate the use of PreparedStatement.	2	CO6
LLO 30.1 Implement dynamic query.	30	*Write program to retrieve data from table using ResultSet interface.(Use various methods of navigation methods).	2	CO6

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)

Other

- Complete any course of Java Programming on Infosys Springboard/Spoken Tutorial/NPTEL
- Develop java code for given problem suggested by course teacher.

Micro project

- Develop mini-ATM machine system. It should accept account_no, account_holder_name, account_balance and perform operations such as withdrawal, Deposit and balance check.
- Develop Quiz Management System. Quiz should accept student credentials and contain 10 MCQ type questions. Determine the final result. Save the result in table along with student credentials.
- Energy Billing System: Expected to develop bill amount module based on usage of energy consumption.
- Develop Employee Management System. Insert employee details such as employee_name, emp_id,emp_salary etc.. into database and retrieve data from table.
- Any other micro project as suggested by course teacher.

Assignment

- Solve assignment covering all COs given by course teacher.

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	Databases like MySQL, Oracle, MS-Access or any other.	27,28,29,30
2	Computer System (Any computer system with basic configuration).	All
3	Computer with JDK1.8 or above, any IDE for Java Programming such as Eclipse, Jcreator, NetBeans,VScode .	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	I	Basic Syntactical Constructs in Java	CO1	8	4	4	4	12
2	II	Inheritance, Interface and Packages	CO2	10	2	4	6	12
3	III	Exception Handling and Multithreading	CO3	12	2	4	6	12
4	IV	Event handling using Abstract Window Toolkit (AWT) & Swings Components	CO4	14	4	4	8	16
5	V	Basics of Network Programming	CO5	8	2	4	4	10
6	VI	Interacting with Database	CO6	8	2	2	4	8
Grand Total				**60**	**16**	**22**	**32**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators.
- Each practical will be assessed considering 60% weightage to process 40% weightage to product
- A continuous assessment based on term work

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	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	2	1	2	--	1	1			
CO2	2	2	2	2	--	1	1			
CO3	2	2	2	2	--	1	1			
CO4	2	2	2	2	1	2	2			
CO5	2	2	3	2	1	2	2			
CO6	2	2	3	3	1	2	2			

Legends :- High:03, Medium:02,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	E Balaguruswamy	Programming with JAVA	Mcgraw Hill Education (India) Private Limited, New Delhi . ISBN-13: 978-93-5134-320-2
2	Schildt Herbert	Java Complete Reference	Mcgraw Hill Education, New Delhi . ISBN:9789339212094
3	Holzner, Steven et al	Java 8 Programming Black Book	Dreamtech Press, New Delhi. ISBN: 978-93-5119-758-4

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.javatpoint.com/java-tutorial	All content
2	https://www.w3schools.com/java/	All content
3	https://www.tutorialspoint.com/java/index.htm	All content

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Sr.No	Link / Portal	Description
4	https://www.programiz.com/java-programming/online-compiler/	Online compiler for java
5	https://onecompiler.com/java	Online compiler for java
6	https://www.odbms.org/wp-content/uploads/2013/11/009.01-Arlow-JDBC-Tutorial-July-2005.pdf	Database Connectivity
7	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_29959473947367270000_shared/overview	All content
8	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013842009554911232973 0_shared/overview	All content
9	https://onlinecourses.nptel.ac.in/noc22_cs47/preview	All content

Note :

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

DATA COMMUNICATION AND COMPUTER NETWORK **Course Code : 314318**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Data Sciences/ Computer Hardware & Maintenance/ Information Technology/ Computer Science & Information Technology/ Computer Science**
Programme Code	**: AI/ AN/ BD/ CM/ CO/ CW/ DS/ HA/ IF/ IH/ SE**
Semester	**: Fourth**
Course Title	**: DATA COMMUNICATION AND COMPUTER NETWORK**
Course Code	**: 314318**

I. RATIONALE

Data communication and computer networks are essential components of modern computing infrastructure, enabling seamless exchange of information and facilitating collaboration across various devices and locations. By considering various applications, students should be able to choose, classify, install, troubleshoot, and maintain various data communication networks. This course provides the important concepts and techniques related to networking and offer students to have valuable insights into technology behind network communication.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified Outcome through various teaching learning experiences:

• Manage Data Communication and Computer Network

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Analyze the functioning of Data Communication and Computer Network.
- CO2 - Select relevant Transmission Media and Switching Techniques as per need.
- CO3 - Analyze the Transmission Errors with respect to IEEE standards.
- CO4 - Configure different TCP/IP services.
- CO5 - Implement relevant Network Topology using Networking Devices.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
314318	DATA COMMUNICATION AND COMPUTER NETWORK	DCN	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175

DATA COMMUNICATION AND COMPUTER NETWORK **Course Code : 314318**

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 Describe the role of the given component in the process of data communication. TLO 1.2 Compare the characteristics of analog and digital signals on the given parameter. TLO 1.3 Explain the process of data communication using the given mode. TLO 1.4 Classify computer networks on the specified parameter.	**Unit - I Fundamentals of Data Communication and Computer Network** 1.1 Process of data communication and its components: Transmitter, Receiver, Medium, Message, Protocol 1.2 Protocols, Standards, Standard organizations, Bandwidth, Data Transmission Rate, Baud Rate and Bits per second 1.3 Modes of Communication (Simplex, Half duplex, Full Duplex) 1.4 Analog Signal and Digital Signal, Analog and Digital Transmission: Analog To Digital, Digital To Analog Conversion 1.5 Fundamental Of Computer Network: Definition And Need Of Computer Network, Applications, Network Benefits 1.6 Classification Of Network: LAN, WAN,MAN	Lecture Using Chalk-Board, Presentations, Video Demonstrations

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 Explain with sketches the construction of a given type of cable. TLO 2.2 Explain with sketches the characteristics of the given type of unguided transmission media. TLO 2.3 Explain with sketches the working of the given Multiplexing technique. TLO 2.4 Describe with sketches the working principle of the given Switching technique. TLO 2.5 Compare different Switching techniques on the given parameter.	**Unit - II Transmission Media And Switching** 2.1 Communication Media: Guided Transmission Media Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable 2.2 Unguided Transmission Media: Radio Waves, Microwaves, Infrared, Satellite 2.3 Line-of-Sight Transmission, Point-to-Point, Broadcast 2.4 Multiplexing: Frequency-Division Multiplexing ,Time - Division Multiplexing 2.5 Switching: Circuit-switched network, Packet switched network	Lecture Using Chalk-Board, Presentations, Video Demonstrations
3	TLO 3.1 Explain working of the given error detection and correction method. TLO 3.2 Explain features of the given IEEE communication standard. TLO 3.3 Explain characteristics of the given layer in IEEE 802.11 architecture. TLO 3.4 Explain with sketches the process of creating a Bluetooth environment using the given architecture. TLO 3.5 Compare the specified generations of mobile telephone systems on the given parameter.	**Unit - III Error Detection and Correction** 3.1 Types of Errors, Forward Error Correction Versus Retransmission 3.2 Framing: Fixed Sized and Variable Sized Framing 3.3 Error Detection: Repetition codes, Parity bits, Checksums, CRC 3.4 Error Correction: Automatic Repeat Request (ARQ), Hamming Code 3.5 Wireless LAN IEEE 802.11 standard Architecture, Features of IEEE 802.11 versions: 802.11,802.11a,802.11b,802.11g,802.11n,802.11p 3.6 Bluetooth Architecture: Piconet, Scatternet 3.7 Mobile Generations: 3G, 4G and 5G	Lecture Using Chalk-Board, Presentations, Video Demonstrations, Flipped Classroom

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 Identify functions and features of the given layer of OSI Reference model. TLO 4.2 Compare the specified service on the given parameters. TLO 4.3 Classify IP Addresses on the basis of its class from the given set of addresses. TLO 4.4 Distinguish between IPv4 and IPv6 on the given parameters. TLO 4.5 Describe with sketches the procedure to configure the given TCP/IP service.	**Unit - IV Network Communication Models** 4.1 THE OSI MODEL: Layered Architecture, Encapsulation 4.2 Layers in OSI Model(Functions of each layer)-Physical Layer,Data-Link Layer,Network Layer,Transport Layer,Session Layer,Presentation Layer,Application Layer 4.3 TCP/IP Layers and their functions: Host To Network Layer,Internet Layer,Transport Layer,Application Layer 4.4 Protocols: Host To Network Layer-SLIP,PPP, Internet Layer-IP,ARP,RARP,ICMP, Transport Layer-TCP and UDP, Application Layer-FTP,HTTP,SMTP,TELNET,BOOTP,DHCP 4.5 Addressing: Physical Address, Logical Address, Port Address 4.6 IP Address-Concept, Notation, Address Space 4.7 IPv4 Addressing: Classful and Classless Addressing ,subnet mask,supernetting,subnetting 4.8 IPV6 Addressing scheme and basic structure	Lecture Using Chalk-Board, Presentations, Case Study, Flipped Classroom
5	TLO 5.1 Compare different computing models on the given parameter. TLO 5.2 Identify relevant network topology for the given situation. TLO 5.3 Compare different topologies on the given parameter. TLO 5.4 Select network connecting device for the given situation. TLO 5.5 Describe with sketches the procedure to configure the given networking device.	**Unit - V Network Topologies And Network Devices** 5.1 Network Computing Model: Peer To Peer, Client Server 5.2 Network Topologies: Introduction, Definition, Selection criteria, Types of Topology- Star ,Mesh, Tree, Hybrid 5.3 Network Connecting Devices: Switch, Router, Repeater, Bridge, Gateways and Modem	Lecture Using Chalk-Board, Video Demonstrations, Flipped Classroom

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 Implement Amplitude Shift Keying(ASK)	1	* Amplitude Shift Keying(ASK) using any simulator	2	CO1
LLO 2.1 Implement Frequency Shift Keying(FSK)	2	Frequency Shift Keying(FSK) using any simulator	2	CO1
LLO 3.1 Implement Phase Shift Keying(PSK)	3	Phase Shift Keying(PSK) using any open source simulation software	2	CO1

DATA COMMUNICATION AND COMPUTER NETWORK **Course Code : 314318**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Create standard network straight cable by using cable tester.	4	*Create and Test standard straight network cable(Universal Colour Code) using crimping tool	2	CO2
LLO 5.1 Create standard Cross network cable by using cable tester.	5	Create and Test standard Cross network cable(Universal Colour Code) using crimping tool	2	CO2
LLO 6.1 Use basic programming skills to simulate communication systems. LLO 6.2 Debug and execute the program for Time Division Multiplexing(TDM).	6	* Generate a Time Division Multiplexing(TDM) signal using relevant simulation software	2	CO2
LLO 7.1 Transfer data using Bluetooth.	7	*Create a Hybrid Network Using Bluetooth	2	CO3
LLO 8.1 Identify different error detection methods. LLO 8.2 Detect errors using Checksum.	8	*Locate the error bit in the given data string by applying checksum error detection method	2	CO3
LLO 9.1 create WI-FI environment.	9	*Implement Wireless network	2	CO3
LLO 10.1 Draw block diagram for parity check. LLO 10.2 Implement parity check with examples.	10	Write a ‘C’ program for parity check error detection	2	CO3
LLO 11.1 Implement C Program for CRC	11	*Write a ‘C’ program for Cyclic Redundancy Check(CRC) error detection	2	CO3
LLO 12.1 Implement Hamming code in any suitable programming language.	12	*Write a ‘C’ program for error correction using Hamming code	2	CO3
LLO 13.1 Use IP address and appropriate subnet mask for given problem statement.	13	*Configure static IP address in operating system along with appropriate subnet mask for given problem	2	CO4
LLO 14.1 Implement IP addresses for intranet in Class A, Class B, Class C.	14	* Implement Classful Address in a given network node i)Identify range of IP Address in various classes ii)Justify the reason to choose various IP address classes for creating given network	2	CO4
LLO 15.1 Troubleshoot computer network using commands.	15	*Execute TCP/IP network commands:ipconfig,ping,tracert	2	CO4
LLO 16.1 Troubleshoot computer network using commands.	16	*Execute TCP/IP network commands: netstat, pathping, route	2	CO4
LLO 17.1 Use wireshark packet sniffer software.	17	*1) Install Wireshark and configure as packet sniffer- i)Capture IP,TELNET, FTP packets using Wireshark	2	CO4
LLO 18.1 Measure various types of Delay by using Wireshark.	18	Capture TCP and UDP packet using Wireshark	2	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 19.1 Filter ARP and ICMP packet Traffic using Wireshark.	19	Capture ARP and ICMP packet Traffic using Wireshark	2	CO4
LLO 20.1 Install server operating system	20	Install Operating System Linux/Windows/Any other Server	2	CO4
LLO 21.1 Create FTP Server	21	Use FTP protocol to transfer file from one system to another system	2	CO4
LLO 22.1 Implement IPv6 addressing scheme on a network.	22	Create IPv6 environment in a small network using simulator	2	CO4
LLO 23.1 Configure HTTP server on given operating system.	23	*Create HTTP server	2	CO5
LLO 24.1 Use star topology for a given situation.	24	*Create computers using Star topology with wired media	2	CO5
LLO 25.1 Use Network simulator CISCO packet tracer.	25	Create Tree topology using CISCO packet tracer software	2	CO5
LLO 26.1 Implement remote login feature.	26	Configure TELNET for remote login	2	CO5
LLO 27.1 Survey existing network infrastructure.	27	*Visit your computer laboratory- i)Identify the type of topology ii)Identify types of connecting devices with specifications iii)Identify types of cables with specifications iv)List the type of network applications commonly used in the laboratory iv)Draw the layout of installed network	4	CO5
LLO 28.1 Transfer a file from one computer to another. LLO 28.2 Print documents from remote system in a network.	28	Share folder and printer in a network	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)

Assignment

- Solve an assignment on any relevant topic given by the Teacher
- For a trading firm an organization with 10users, draw network architecture design of wireless LAN.
- Identify appropriate network topology and network connecting devices for following requirement. Draw network design for proposed network. An organization having its office in a building of 5 floor. Each floor it needs 20

machines. There is one File server. Each floor has 2 print servers to facilitate printer capacity using Tree topology.

Micro project

- Install and configure NIC and find MAC Address of Device
- Design a network using any topology and do fault identification
- Create a tool that monitors network bandwidth usage in real-time

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	Desktop Computer with basic configuration	All
2	Network Tool Kit: Crimping Tool for RJ-45 connector ,3in 1 modular crimping tool for RJ-45 UTP CAT-5/CAT-6 Networking Cable,LAN Cutter 8P/6pP/4P All-in-One or similar,Cable Tester/LAN Tester(Specification: Network Cable Tester for LAN RJ-45/CAT5/CAT6 UTP Wire Test Tool or similar)	All
3	Network Accessories: RJ45 connector, UTP cable, optical fibre cable, Coaxial cable, various connectors,1000Mbps NIC	All
4	UPS 6 KVA online	All
5	Ethernet Switch- 4/8/16/24/32	All
6	Router-256MB Memory storage capacity, compatible with Desktop and Laptop, Rack Mountable, Wireless Connectivity	All
7	Printer	All
8	Wireshark(https://www.wireshark.org/download.html)or any other Packet Analyzer Tool	All
9	Simulation Software: CISCO Packet Tracer, CORE Network Emulator or Similar	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	I	Fundamentals of Data Communication and Computer Network	CO1	10	4	8	4	16
2	II	Transmission Media And Switching	CO2	10	4	4	6	14
3	III	Error Detection and Correction	CO3	8	4	4	6	14
4	IV	Network Communication Models	CO4	12	4	6	8	18

DATA COMMUNICATION AND COMPUTER NETWORK **Course Code : 314318**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
5	V	Network Topologies And Network Devices	CO5	5	2	2	4	8
Grand Total				**45**	**18**	**24**	**28**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators.
- Each practical will be assessed considering 60% weightage to process, 40% weightage to product.
- A continuous assessment based term work.

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	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	-	2	1	-	-	1			
CO2	1	1	2	1	-	1	1			
CO3	1	2	1	1	-	-	1			
CO4	1	2	2	1	-	1	1			
CO5	-	2	2	1	1	1	1			

Legends :- High:03, Medium:02,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	Behrouz A. Forouzan	Data Communication and Networking	McGraw-Hill Higher Education ISBN-13 978-0-07-296775-3
2	Behrouz A. Forouzan:	TCP/IP Protocol Suit	McGraw Hill Education ISBN-13 978-0073376042
3	A.S. Tanenbaum	Computer Networks	PRENTICE HALL ISBN-10: 0-13-212695-8 ,ISBN-13:978-0-13-212695-3
4	Godbole Achyut	Data Communication and Networks	McGraw Hill Education ISBN-10 9780071077705,ISBN-13 978-0071077705

Sr.No	Author	Title	Publisher with ISBN Number
5	Comer Douglas E.	TCP/IP Principles, Protocols and Architectures	PEARSON ISBN 10: 0-13-608530-X ISBN 13: 978-0-13-608530-0

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.geeksforgeeks.org/data-communication-definition-components-types-channels/	Data Communication-Definition, Components,Types,Channels
2	https://www.tutorialspoint.com/data_communication_computer_network/index.htm	Data Communication and Computer Network
3	https://nptel.ac.in/courses/106105081	Computer Networks
4	https://nptel.ac.in/courses/106105183	Computer Networks and Internet Protocol
5	Introduction To Computer Networks | Studytonight	Introduction To Computer Networks

Note :

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

MICROPROCESSOR PROGRAMMING **Course Code : 314321**

Programme Name/s	**: Artificial Intelligence/ Artificial Intelligence and Machine Learning/ Computer Technology/ Computer Engineering/ Computer Science & Engineering/ Data Sciences/ Computer Hardware & Maintenance/ Computer Science/**
Programme Code	**: AI/ AN/ CM/ CO/ CW/ DS/ HA/ SE**
Semester	**: Fourth**
Course Title	**: MICROPROCESSOR PROGRAMMING**
Course Code	**: 314321**

I. RATIONALE

The microprocessor is the most vital component of a computer system and is considered be its' brain and heart. This course will cover the basics of 8086 and its architecture along with instruction set, data types, assembly language programming with effective use of procedure and macro. This course will enable the students to inculcate assembly language programming concepts and methodology to solve problems related with microprocessor-based systems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

This course aims to help the student to attain the following industry expected outcomes through various teaching-learning experiences:
*Develop assembly language programs using 8086.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Analyze the functional block diagram of 8086 microprocessor.
- CO2 - Use program development tools and assembler directives.
- CO3 - Use instructions in different addressing modes.
- CO4 - Develop an assembly language program for a given task using assembler.
- CO5 - Use procedures and macros to develop an assembly language program for a given problem.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical							
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA			
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min		
314321	MICROPROCESSOR PROGRAMMING	MIC	DSC	3	-	2	1	6	3	3	30	70	100	40	25	10	25@	10	25	10	175	

MICROPROCESSOR PROGRAMMING **Course Code : 314321**

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 Describe the function of the given pin of 8086. TLO 1.2 Explain function of Bus Interface Unit and Execution Unit in 8086 Microprocessor. TLO 1.3 State functions of the given Register of 8086 Microprocessor. TLO 1.4 Calculate the physical address for the given segmentation of 8086 Microprocessor.	**Unit - I 8086-16 Bit Microprocessor** 1.1 8086 Microprocessor: Salient features, pin descriptions 1.2 Architecture of 8086: Functional block diagram, register organization 1.3 Concept of pipelining 1.4 Memory segmentation, Physical memory addresses generation	Lecture using chalk-board Presentations Hands-on
2	TLO 2.1 Describe the given steps of program development and execution. TLO 2.2 Write steps to develop a code for the given problem using assembly language. TLO 2.3 Use relevant command of debugger to correct the specified programming error. TLO 2.4 Describe function of the given assembler directives with example.	**Unit - II The Art of Assembly Language Programming** 2.1 Program development steps: Problem definition, Algorithm, Flowchart, Initialization checklist, Choosing instructions, Converting algorithm into assembly language program 2.2 Assembly Language Programming Tools: • Editor • Assembler • Linker • Debugger 2.3 Assembler directives	Lecture using chalk-board Presentations Hands-on Collaborative learning

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 Determine the length of the given instruction. TLO 3.2 Describe the given addressing modes with examples. TLO 3.3 Explain the operation performed by the given instruction during its execution. TLO 3.4 Identify the addressing mode of the given instruction.	**Unit - III Instruction Set of 8086 Microprocessor** 3.1 Machine language instruction format 3.2 Addressing modes 3.3 Instruction set: • Arithmetic instructions • Logical Instructions • Data transfer instructions • Flag manipulation instructions • String operation instructions • Program control transfer or branching instructions • Process control instructions	Lecture using chalk-board Presentations Hands-on Collaborative learning
4	TLO 4.1 Use the given model of assembly language program for the given problem. TLO 4.2 Develop ALP for the given problem. TLO 4.3 Apply relevant control loops in the program for the given problem. TLO 4.4 Use string instruction to manipulate the elements of the given block of data.	**Unit - IV Assembly Language Programming** 4.1 Models of 8086 assembly language program 4.2 Programming using assembler: • Arithmetic operations on hexadecimal and BCD numbers • Sum of series • Smallest and largest numbers from array • Sorting numbers in ascending and descending order • Check whether given number is odd or even • Check whether given number is positive or negative • Block transfer • String operations - Length, Reverse, Compare, Concatenation, Copy • Count numbers of '1' and '0' in 16 bit number	Lecture using chalk-board Presentations Hands-on Collaborative learning
5	TLO 5.1 Apply the relevant 'parameter- passing' method in the given situation. TLO 5.2 Develop an assembly language program using the relevant procedure for the given problem. TLO 5.3 Develop an assembly language program using macros for the given problem. TLO 5.4 Compare procedures and macros on the basis of the given parameter.	**Unit - V Procedure and Macro** 5.1 Procedure: Defining and calling procedure - PROC, ENDP, FAR and NEAR Directives; CALL and RET instructions; Parameter passing methods, Assembly language programs using procedure 5.2 Macro: Defining macro, MACRO and ENDM Directives, Macro with parameters, Assembly language programs using macro	Lecture using chalk-board Presentations Hands-on Collaborative learning

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 functions of various blocks in 8086 architecture. LLO 1.2 Identify the use of registers of 8086.	1	* Identification of various blocks in 8086 microprocessor architecture	2	CO1

MICROPROCESSOR PROGRAMMING **Course Code : 314321**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 2.1 Identify the function of given assembly language tool. LLO 2.2 Use assembler directives in a given situation.	2	* Use assembly language programming (ALP) tools and directives	2	CO2
LLO 3.1 Use different addressing mode instructions in program. LLO 3.2 Write an assembly language program for addition and subtraction using different addressing mode instruction.	3	* ALP to perform addition and subtraction of two given numbers	2	CO3
LLO 4.1 Write an assembly language program for multiplication of two 16 bit unsigned numbers. LLO 4.2 Write an assembly language program for multiplication of two 16 bit signed numbers.	4	ALP for multiplication of two signed and unsigned numbers	2	CO3
LLO 5.1 Write an assembly language program for division of two unsigned numbers. LLO 5.2 Write an assembly language program for division of two signed numbers.	5	ALP to perform division of two unsigned and signed numbers	2	CO3
LLO 6.1 Use DAA and DAS instructions to perform arithmetic operations on BCD numbers. LLO 6.2 Write an ALP to perform arithmetic operations on BCD numbers.	6	ALP to add, subtract, multiply and divide two BCD numbers	2	CO3
LLO 7.1 Implement loop in assembly language program. LLO 7.2 Use string instruction to perform block transfer operation. LLO 7.3 Write an ALP to perform block transfer data without using string instruction. LLO 7.4 Write an ALP to perform block transfer data with using string instruction.	7	* ALP to perform block transfer operation	2	CO4
LLO 8.1 Implement loop in assembly language program to find sum of series. LLO 8.2 Write an assembly language program to find sum of series of n Hexadecimal numbers. LLO 8.3 Write an assembly language program to find sum of series of n BCD numbers.	8	ALP to find sum of series	2	CO4
LLO 9.1 Implement loop in assembly language program to find smallest and largest number from the array of n numbers. LLO 9.2 Use decision making branching instruction to find smallest or largest number. LLO 9.3 Write an assembly language program to find smallest number from the array of n numbers. LLO 9.4 Write an assembly language program to find largest number from the array of n numbers.	9	* ALP to find smallest and largest number from array of numbers	2	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 10.1 Apply iterative method to arrange numbers in array in ascending or descending order. LLO 10.2 Write an assembly language program to arrange numbers in array in ascending order. LLO 10.3 Write an assembly language program to arrange numbers in array in descending order.	10	ALP to arrange numbers in an array in ascending or descending order	2	CO4
LLO 11.1 Write an assembly language program to find length of string. LLO 11.2 Write an assembly language program to concatenate two strings.	11	* ALP to find the length of string and concatanate two strings	2	CO4
LLO 12.1 Write an assembly language program to copy string. LLO 12.2 Write an assembly language program to copy string in reverse order.	12	ALP for string operations such as string reverse and string copy	2	CO4
LLO 13.1 Write an assembly language program to compare two strings without string instruction. LLO 13.2 Write an assembly language program to compare two strings using string instruction.	13	ALP to compare two strings	2	CO4
LLO 14.1 Use div and rotate instructions to check the given number is odd or even. LLO 14.2 Write an assembly language program to count odd and even from the array of n numbers.	14	* ALP to check a given number is odd or even	2	CO4
LLO 15.1 Use rotate instructions to check the given number is positive or negative. LLO 15.2 Write an assembly language program to count positive and negative numbers in given array.	15	ALP to check a given number is positive or negative	2	CO4
LLO 16.1 Use rotate instructions to count '0' and '1' in the given number. LLO 16.2 Write an assembly language program to count number of' ‘0' and '1's in a given number.	16	ALP to count number of' ‘0' and '1's in a given number	2	CO4
LLO 17.1 Use CALL and RET instructions to call procedures using different parameter passing methods.. LLO 17.2 Use assembler directives: PROC and ENDP to write the procedure. LLO 17.3 Write an assembly language program using procedure to perform for addition, subtraction, multiplication and division. LLO 17.4 Write an assembly language program using procedure to solve equation such as Z = (A+B)*(C+D).	17	* ALP to perform arithmetic operations on given numbers using procedure	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 18.1 Use assembler directives MACRO and ENDM to write the macros using parameters. LLO 18.2 Write an assembly language program using macro to perform for addition, subtraction, multiplication and division. LLO 18.3 Write an assembly language program using macro to solve equation such as Z = (A+B)* (C+D).	18	ALP to perform arithmetic operations on given numbers using macro	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

- The micro project has to be laboratory-based developed in assembly language as suggested by teacher. Each microproject should encompass of two or more CO's which are in fact, an integration of laboratory experiments and LLO's. Some of the suggested microprojects are given below.

a. Conversion of number system-(Any one):
1. Convert hexadecimal number to equivalent BCD.
2. Convert BCD number to equivalent hexadecimal number

b. Array-(Any one):
1. Separate odd and even number from given array, store them in separate array and find the sum.
2. Separate odd and even number from given array, store them in separate array and find the smallest and largest among them.
3. Separate odd and even number from given array, store them in separate array and sort numbers in ascending and descending order.

c. Basic mathematical functions-(Any one):
1. Generate fibonacci series.
2. Calculate a factorial of given number.

d. String manipulation-(Any one):
1. Convert given lower case string to upper case string and vice-versa.
2. Check the given string for palindrome.
3. Search given character and its position in a string; i.e. find how many times character is present in a string and its position in a string.

Assignment

- Prepare a comparative survey report of 8086 microprocessor with i3, i5, i7, i9 or AMD Ryzen processor.

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	**Hardware:** Personal computer, (Processor i3 onwords preferable), RAM minimum 2GB Operating system: Windows-7 onwards	All
2	**Software:** a) Assembler: Borland Turbo (TASM) / Microsoft Assembler (MASM) b) Linker: Borland Turbo (TLINK) / Microsoft (LINK) c) Debugger: Borland Turbo (TD) / Microsoft debugger (CS or Debug) d) Editor: DOS-Edit / Notepad	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	I	8086-16 Bit Microprocessor	CO1	6	2	6	6	14
2	II	The Art of Assembly Language Programming	CO2	6	2	2	4	8
3	III	Instruction Set of 8086 Microprocessor	CO3	12	2	8	8	18
4	IV	Assembly Language Programming	CO4	15	0	4	16	20
5	V	Procedure and Macro	CO5	6	2	4	4	10
Grand Total				**45**	**8**	**24**	**38**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Continuous assessment based on process and product related performance indicators
- Each practical will be assessed considering 60% weightage to process 40% weightage to product.

Summative Assessment (Assessment of Learning)

- End semester examination, Lab performance, Viva-voce

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	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			
CO2	2	1	1	2	-	1	1			
CO3	3	2	2	2	-	1	1			
CO4	3	3	3	2	-	1	1			
CO5	3	3	3	2	-	1	1			

Legends :- High:03, Medium:02,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	Douglas V. Hall	Microprocessor and Interfacing (Programming and Hardware)	McGraw Hill Education, New Delhi ISBN-13: 978-0070257429
2	Walter A. Triebel, Avtar Singh	The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications	Pearson Publications, New Delhi ISBN-13: 978-0131228047
3	Sunil Mathur	Microprocessor 8086: Architecture, Programming and Interfacing	PHI, New Delhi ISBN-13: 978-8120340879
4	K. R. Venugopal and Raj Kumar	Microprocessor X86 Programming	BPB Publications, Delhi ISBN-13: 978-8170294580

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.tutorialspoint.com/microprocessor/microprocessor_8086_overview.htm	Architecture of 8086
2	https://www.geeksforgeeks.org/architecture-of-8086/	Architecture of 8086
3	https://www.javatpoint.com/8086-microprocessor	Pin description and Architecture of 8086
4	https://electronicsdesk.com/assembler-directives.html	Assembler directives
5	https://www.geeksforgeeks.org/addressing-modes-8086-microprocessor/	Addressing modes of 8086

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Sr.No	Link / Portal	Description
6	https://www.tutorialspoint.com/microprocessor/microprocessor_8086_addressing_modes.htm	Addressing modes of 8086
7	https://www.tutorialspoint.com/microprocessor/microprocessor_8086_instruction_sets.htm	Instruction set of 8086
8	https://www.javatpoint.com/instruction-set-of-8086	Instruction set of 8086
9	https://nptel.ac.in/courses/108103157	NPTEL Course on Microprocessors and Interfacing

Note :

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

Programme Name/s	**: 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./ 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**
Course Title	**: EXIT INDUSTRIAL TRAINING (Full Time)**
Course Code	**: 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.

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IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-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.

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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

Week No	Tentative Activities to be completed during Industry training

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1	Introduction of Industry and departments.
2	Study of Layout of Industry, Specifications of Machines , raw materials, components available in the industry
3-5	Execute given project or work assigned to the students ,study of safety and maintenance procedures
4/6	Report writing

VII. Summative Assessment (SA) of training:

Academic year : 20 -20

Name of the industry:

Marks Acquired :

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

Name of mentor :

Signature of Mentor :

VII. FORMATS

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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 : _____

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Name and Signature of the student:

Phone Number of students:

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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 :

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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
Week 01	**Mon, Date**			
	Tue, Date			
	Wed, Date			
	Thu, Date			
	Fri, Date			
	Sat, Date			
.	**Mon, Date**			
	Tue, Date			
.	**Wed, Date**			
	Thu, Date			
.	**Fri, Date**			
	Sat, Date			
Week n	**Mon, Date**			
	Tue, Date			
	Wed, Date			
	Thu, Date			
	Fri, Date			
	Sat, Date			

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Programme Name/s	**: 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./ 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**
Course Title	**: SECOND YEAR EXIT COURSE (Online)**
Course Code	**: 312022**

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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 Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	

312022	SECOND YEAR EXIT COURSE (Online)	SYEC	SEC	-	-	-	-	0	4	-	-	-	-	-	-	-	50@	20	-	-	50

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.

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B) Suggested RUBRIC for SA

Title : Second Year Exiting Students

Enrollment Number	Courses Undertaken	No.Of Hrs.	Overall Understanding (20 Mks.)	Knowledge/Skill Acquired (20 Mks.)	Certification (10 Mks.)	Total (50 Mks.)
	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**	**Brief Description**
1	Explore Machine Learning Using Python	Infosys Springboard	TOC - Explore Machine Learning using Python | Infosys Springboard	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	TOC - Unity Game - Role Playing Game(RPG) | Infosys Springboard	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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5	Unity Game - Gem Collector Game	Infosys Springboard	TOC - Unity Game - Gem Collector Game | Infosys Springboard	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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6	Hands-on Scikit-learn for Machine Learning	Infosys Springboard	TOC - Hands-on Scikit-learn for Machine Learning | Infosys Springboard	10Hr 2 min	Scikit-learn is arguably the most popular Python library for Machine Learning today. Thousands of Data Scientists and Machine Learning practitioners use it for day to day tasks throughout a Machine Learning project's life cycle. Due to its popularity and coverage of a wide variety of ML models and built-in utilities, jobs for Scikit-learn are in high demand, both in industry and academia. If you're an aspiring machine 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 the end of the course, you will have a set of ML problem-solving tools in the form of code modules and utility functions based on Scikit-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 sets.
7	UX Design for Web Developers	Infosys Springboard	. TOC - UX Design for Web Developers | Infosys Springboard	4 Hr 44 min	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**	**IS 962:1989** - Code of Practice for Architectural and Building Drawings.		**8 weeks**	**IS 962:1989** - Code of Practice for Architectural and Building Drawings.
2	**Computer Aided Drawing**	**IS 16601:2016 -** Guidelines for Digital Representation of Engineering Drawings.		**8 weeks**	**IS 16601:2016 -** Guidelines for Digital Representation of Engineering Drawings.
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3	**Architectural Drawing**	**IS 962:1989** - Code of Practice for Architectural and Building Drawings.		**8 weeks**	**IS 962:1989** - Code of Practice for Architectural and Building Drawings.
4	**Python Learning**	**ISO/IEC 25010 -** System and Software Quality Requirements and Evaluation (SQuaRE).		**8 weeks**	**ISO/IEC 25010 -** System and Software Quality Requirements and Evaluation (SQuaRE).
5	**Information Security**	**IS/ISO/IEC 27001:2013 -** Information Security Management.		**8 weeks**	**IS/ISO/IEC 27001:2013 -** Information Security Management.
6	**History of Ancient Architecture**	**Swayam**	https://onlinecourses.swayam2.ac.in/ini25_ar01/preview	**8 weeks**	**IS 2645:2003 -** Architectural Preservation and Conservation Standards. Guidelines from the **ASI (Archaeological Survey of India).**
7	**Bioclimatic Architecture**	**Swayam**	https://onlinecourses.nptel.ac.in/noc25_ar06/preview	**8 weeks**	**IS 3362:1977 -** Thermal Insulation of Buildings. **IS 875 (Part 2):1987 -** Environmental Considerations in Building Design. **IS 3792:2022 -** Energy-Efficient and Sustainable Buildings.
8	**Acoustic materials and meta materials**	**Swayam**	https://onlinecourses.nptel.ac.in/noc25_me01/preview	**8 weeks**	**IS 2526:1963** - Specification for Acoustic Material Properties. **IS 4954:1968** - Sound Insulation Materials and Applications. **IS 13356:2000** - Standards for Noise Control in Buildings.
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9	**Interior Design**	**Swayam**	https://onlinecourses.nptel.ac.in/noc25_de11/preview	**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.org/		
Program Group : Civil Engineering					
1	Civil 3D	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329184936572518455 28_shared/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.nptel.ac.in/noc25_ce31/preview	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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4	Advanced Topics in Science and Technology of Concrete	NPTEL -SWAYAM	https://onlinecourses.nptel.ac.in/noc25_ce64/preview	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.nptel.ac.in/noc25_ce65/preview	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.onwingspan.com/web/en/app/toc/lex_auth_01384272204612403222498_shared/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.onwingspan.com/web/en/app/toc/lex_auth_01384208087630643211723_shared/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
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9	SketchUp Case Study - 3D Landscape Garden	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384208345624576011846_shared/overview	3 hrs 15 min	The Landscape 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
Programme Code : Chemical Engineering					
1	Effective Time Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	3 Hr 46 min	Certificate Course
2	Stress Management at Workplace	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	2 Hr 53 min	Certificate Course
3	Senior Professional in Human Resourcess : Safety and Health	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	1 Hr 8 min	Certificate Course
4	Indian oil & Gas Sector	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	1 Hr 38 min	Certificate Course
5	Fundamental of Information Security	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	3 Hr 24 min	Certificate Course
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6	Design Thinking	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	3 Hr 31 min	Certificate Course
7	Security Standards & Regulations	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	4 Hr 08 min	Certificate Course
8	Management & Leadership	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	1 Hr 45 min	Certificate Course
9	Material Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	3 Hr 21 min	Certificate Course
10	Risk Management Investement Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	5 Hr 44 min	Certificate Course
11	Financial Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	2 Hr 41 Min	Certificate Course
12	Quality Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	3Hr 51 Min	Certificate Course
13	Fundamental of Risk Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	4 Hr 21 Min	Certificate Course
14	Theories of Stratregic Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	7 Hr 18 Min	Certificate Course
15	Customer Relationship Management	Infosis Springboard	https://infyspringboard.onwingspan.com/web/en/page/home	5 Hr 18 Min	Certificate Course
Programme Code : Electrical Engineering					
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1	Internet of Things 101	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_2155362288252199700 0_shared/overview	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 - Electrical Power Demand Calculation**	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384338332015001637149_shared/overview	2 hours 3 minutes	In this course "Project on AutoCAD - Electrical Power Demand Calculation" learners will look into the realm of electrical engineering through AutoCAD. By focusing on a practical project, learners will gain hands-on experience in calculating power demands for electrical systems. Through step-by-step guidance, learners will utilize AutoCAD to create accurate and detailed electrical schematics, incorporate load calculations, and ensure compliance with industry standards. This course empowers learners to understand the nuances of power distribution and demand estimation, honing their skills in a real-world context. Whether an aspiring electrical engineer or a professional looking to refine expertise, this course equips learner with the knowledge to proficiently perform power demand calculations using AutoCAD
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3	**AutoCAD Case Study - Power Distribution Layout for Commercial Kitchen**	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384338739362201637145_shared/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 handle the power loads of**
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					commercial kitchen equipmen
4	**Electronics Course**	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01373779399397376019/overview	1 hour 26 minutes	**Today, children around the world have access to laptops, desktops, and smartphones. Knowing that the future is becoming 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 Devices**	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384786255477964855134_shared/overview	2 hours	The one and only energy source for our advanced civilization is electricity which is carried to every point of requirement via the cables. With the increase of electrical appliances in the domestic and commercial world, the volume of cables has increased manifold. It has become really necessary to understand and manage the volume properly to avoid accidents and assembling crisis at the time of emergency. Moreover, the type of cables varies as per the source of power and device which they are connected to. The cables are used in all types of electrical devices for proper power distribution and also for communication purpose. In fact in the case of the electronic devices like computers the cables are aptly designed as per the requirement of the parts they are connected with. The insulation and jacketing, as well as 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.
6	**AutoCAD Case Study - Solar Electric Panel Design**	Infosys Springboard	https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384206370179481611614_shared/overview	1 hour 35 minutes	**The project "Solar Electric Power 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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7	**ELECTRICITY**		https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012621207261151232889 3/overview	1 hour 58 minutes	
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8	AutoCAD Case Study - Fire Alarm System Layout		https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384339122647859238065_shared/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
Program Group: Electronics					
1	ESim - EDA tool for circuit design, simulation, analysis and PCB design	SWAYAM , AICTE sponsored	https://onlinecourses.swayam2.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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2	Python for Data Science-	SWAYAM , AICTE sponsored	https://onlinecourses.nptel.ac.in/noc25_cs60/preview	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=AfmBOop0wgNf9R5kWcZUA7pf5Vb7TPYx9xjSL-LR1zqc9pMsX981xn7A&couponCode=ACCAGE0923	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.onwingspan.com/web/en/app/toc/lex_auth_01384174192049356824 83_shared/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.onwingspan.com/web/en/app/toc/lex_auth_012956301298835456131 8_shared/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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7	Microcontroller Embedded C Programming: Absolute Beginners	https://easyshiksha.com/online_courses/	https://easyshiksha.com/online_courses/microcontroller-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.
8	Certificate Course in Internet of Things (IoT)	National Institute of Electronics & Information Technology,Kohima,	https://nielit.gov.in/kohima/content/short-term-courses-22	4 weeks	Introduction to IOT & embedded system, Projects using Arduino Uno and ESP-32:
Programme Group-Mechanical Engineering					
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.
2	GD & T	AICTE	https://neat.aicte-india.org/course-details/NEAT2020616_PROD_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.
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3	CAD using Autodesk Inventor	AICTE	https://neat.aicte-india.org/course-details/NEAT2020621_PROD_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_PROD_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_PROD_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.org/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.skillindiadigital.gov.in/courses/detail/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/learn/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 studies will be used to demonstrate how digital supports business objectives, and how it can set enterprise apart.
4	Counter Sales Executive - Tourism & Hospitality	Tourism & Hospitality Skill Council	https://www.skillindiadigital.gov.in/courses/detail/91f96304-4601-4568-84ec-4a994d2eb6f5	07 Hrs.	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.skillindiadigital.gov.in/courses/detail/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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