

FUNDAMENTALS OF ICT**Course Code : 311001**

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/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Telecommunication 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/ 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/ 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/ SC/ SE/ TC/ TE/ TR/ TX
Semester	: First
Course Title	: FUNDAMENTALS OF ICT
Course Code	: 311001

I. RATIONALE

In any typical business setup in order to carry out routine tasks related to create business documents, perform data analysis and its graphical representations and making electronic slide show presentations, the student need to learn various software as office automation tools like word processing applications, spreadsheets and presentation tools. They also need to use these tools for making their project reports and presentations. The objective of this course is to develop the basic competency in students for using these office automation tools to accomplish the job. This course also presents an overview of emerging technologies so that students of different discipline can appraise the applications of these technologies in their respective domain.

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: 1) Use computers for Internet services, Electronics Documentation, Data Analysis and Slide Presentation. 2) Appraise Application of ICT based Emerging Technologies.in different domain.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use computer system and its peripherals for given purpose
- CO2 - Prepare Business document using Word Processing Tool
- CO3 - Analyze Data and represent it graphically using Spreadsheet
- CO4 - Prepare professional Slide Show presentations
- CO5 - Use different types of Web Browsers and Apps
- CO6 - Explain concept and applications of Emerging Technologies

FUNDAMENTALS OF ICT**Course Code : 311001****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			
				CL	TL	LL					Total	Practical		SLA							
							FA-TH Max	SA-TH Max				FA-PR Max	SA-PR Max	SLA Max	SLA Min						
311001	FUNDAMENTALS OF ICT	ICT	SEC	1	-	2	1	4	2	-	-	-	-	-	25	10	25@	10	25	10	75

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.

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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	<p>TLO 1.1 Explain the functions of components in the block diagram of computer system.</p> <p>TLO 1.2 Classify the given type of software</p> <p>TLO 1.3 Explain characteristics of the given type of network</p> <p>TLO 1.4 Describe application of the given type of network connecting device</p> <p>TLO 1.5 Describe procedure to manage a file /folder in the given way.</p>	<p>Unit - I Introduction to Computer System</p> <p>1.1 Basics of Computer System: Overview of Hardware and Software: block diagram of Computer System, Input/Output unit CPU, Control Unit, Arithmetic logic Unit (ALU), Memory Unit</p> <p>1.2 Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives)</p> <p>1.3 External Devices: Types of input/output devices, types of monitors, keyboards, mouse, printers: Dot matrix, Inkjet and LaserJet, plotter and scanner, external storage devices CD/DVD, Hard disk and pen drive</p> <p>1.4 Application Software: word processing, spreadsheet, database management systems, control software, measuring software, photo-editing software, video-editing software, graphics manipulation software System Software compilers, linkers, device drivers, oper</p> <p>1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth</p> <p>1.6 Working with Operating Systems: Create and manage file and folders, Copy a file, renaming and deleting of files and folders, Searching files and folders, application installation, creating shortcut of application on the desktop.</p>	Hands-on Demonstration Presentations
2	<p>TLO 2.1 Write steps to create the given text document.</p> <p>TLO 2.2 Explain the given feature for document editing.</p> <p>TLO 2.3 Explain the given page setup features of a document.</p> <p>TLO 2.4 Write the given table formatting feature.</p> <p>TLO 2.5 Write the steps to set the given type of document layout</p>	<p>Unit - II Word Processing</p> <p>2.1 Word Processing: Overview of Word processor Basics of Font type, size, colour, Effects like Bold, italic, underline, Subscript and superscript, Case changing options, Previewing a document, Saving a document, Closing a document and exiting application.</p> <p>2.2 Editing a Document: Navigate through a document, Scroll through text, Insert and delete text, Select text, Undo and redo commands, Use drag and drop to move text, Copy, cut and paste, Use the clipboard, Clear formatting, Format and align text, Formatting</p> <p>2.3 Changing the Layout of a Document: Adjust page margins, Change page orientation, Create headers and footers, Set and change indentations, Insert and clear tabs</p> <p>2.4 Inserting Elements to Word Documents: Insert and delete a page break, Insert page numbers, Insert the date and time, Insert special characters (symbols), Insert a picture from a file, Resize and reposition a picture</p> <p>2.5 Working with Tables: Insert a table, Convert a table to text, Navigate and select text in a table, Resize table cells, Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Repeat table headings on subsequent page</p> <p>2.6 Working with Columned Layouts and Section Breaks: a Columns, Section breaks, Creating columns, Newsletter style columns, Changing part of a document layout or formatting, Remove section break, Add columns to remainder of a document, Column widths, Adjust</p>	Hands-on Demonstration Presentations

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Course Code : 311001

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	<p>TLO 3.1 Write steps to create the given spreadsheet.</p> <p>TLO 3.2 Explain the given formatting feature of a worksheet.</p> <p>TLO 3.3 Write steps to insert formula and functions in the given worksheet.</p> <p>TLO 3.4 Write steps to create charts for the given data set.</p> <p>TLO 3.5 Explain steps to perform data filter, sort and validation operations on the given data set.</p> <p>TLO 3.6 Write steps to setup and print a spreadsheet.</p>	<p>Unit - III Spreadsheets</p> <p>3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook.</p> <p>3.2 Editing Worksheet: Insert and select data, adjust row height and column width, delete, move data, insert rows and columns, Copy and Paste, Find and Replace, Spell Check, Zoom In-Out, Special Symbols, Insert Comments, Add Text Box, Undo Changes, - Freeze</p> <p>3.3 Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks, S</p> <p>3.4 Working with Formula: Creating Formulas, Copying Formulas, Common spreadsheet Functions such as sum, average, min, max, date, In, And, or, mathematical functions such as sqrt, power, applying conditions using IF.</p> <p>3.5 Working with Charts: Introduction to charts, overview of different types of charts, Bar, Pie, Line charts, creating and editing charts. Using chart options: chart title, axis title, legend, data labels, Axes, grid lines, moving chart in a separate sheet.</p> <p>3.6 Advanced Operations: Conditional Formatting, Data Filtering, Data Sorting, Using Ranges, Data Validation, Adding Graphics, Printing Worksheets, print area, margins, header, footer and other page setup options.</p>	Hands-on Demonstration Presentations
4	<p>TLO 4.1 Write the steps to create the given slide presentation.</p> <p>TLO 4.2 Write the steps to insert multiple media in the given presentation.</p> <p>TLO 4.3 Explain the method of including animation, transition effects in slide show.</p> <p>TLO 4.4 Write steps to apply table features in the given presentation</p> <p>TLO 4.5 Write steps to manage charts in the given presentation</p>	<p>Unit - IV Presentation Tool</p> <p>4.1 Creating a Presentation: Outline of an effective presentation, Identify the elements of the User Interface, Starting a New Presentation Files, Creating a Basic Presentation, Working with textboxes, Apply Character Formats, Format Paragraphs, View a Prese</p> <p>4.2 Inserting Media elements: Adding and Modifying Graphical Objects to a Presentation - Insert Images into a Presentation, insert audio clips, video/animation, Add Shapes, Add Visual Styles to Text in a Presentation, Edit Graphical Objects on a Slide, Format</p> <p>4.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications.</p> <p>4.4 Working with Charts: Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.</p>	Hands-on Demonstration Presentations

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5	TLO 5.1 Explain use of the given setting option in browsers. TLO 5.2 Explain the given option used for effective searching in search engine TLO 5.3 Explain features of the given web service. TLO 5.4 Explain concepts and applications of emerging technologies TLO 5.5 Use various elementary cloud-based tools.	Unit - V Basics of Internet and Emerging Technologies 5.1 World Wide Web: Introduction, Internet, Intranet, Cloud, Web Sites, web pages, URL, web servers, basic settings of web browsers- history, extension, default page, default search engine, creating and retrieving bookmarks, use search engines effectively for 5.2 Web Services: e-Mail, Chat, Video Conferencing, e-learning, e-shopping, e-Reservation, e-Groups, Social Networking 5.3 Emerging Technologies: IOT, AI and ML, Drone Technologies, 3D Printing. 5.4 Tools: Docs, Drive, forms, quiz, Translate and other Apps	Hands-on 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 Identify various Input/output devices, connections and peripherals of computer system LLO 1.2 Work with Computer System, Input/output devices, and peripherals for manages files and folders for data storage.	1	* a) Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders	2	CO1
LLO 2.1 Create and manage word document. LLO 2.2 Apply formatting features on text at line, paragraph and page level.	2	*Work with document files: a) Create, edit and save document in Word Processing. b) Text, lines and paragraph level formatting	2	CO2
LLO 3.1 Insert and edit images, shapes in a document file	3	Work with Images and Shapes in Word Processing.	2	CO2
LLO 4.1 Insert table and apply various table formatting features on it.	4	*Work with tables in Word Processing.	2	CO2
LLO 5.1 Apply page layout features in word processing. LLO 5.2 Print a document by applying various print options LLO 5.3 Use mail merge in word processing	5	*Working with layout and printing a) Document page layout, Themes, and printing. b) Use of mail merge with options.	2	CO2
LLO 6.1 Enter and format data in a worksheet. LLO 6.2 Insert and delete cells, rows and columns LLO 6.3 Apply alignment feature on cell	6	*Create, open and edit Worksheet.	2	CO3
LLO 7.1 Create formula and "If" condition on cell data LLO 7.2 Apply various functions and named ranges in worksheet.	7	*Formulas and functions in Worksheet.	2	CO3
LLO 8.1 Implement data Sorting, Filtering and Data validation features in a worksheet.	8	*Sort, Filter and validate data in Spreadsheet.	2	CO3
LLO 9.1 Create charts using various chart options in spreadsheet.	9	*Charts for Visual Presentation in Spreadsheet.	2	CO3
LLO 10.1 Print the worksheet by applying various print options for worksheet	10	Worksheet Printing.	2	CO3

FUNDAMENTALS OF ICT**Course Code : 311001**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Apply design themes to the given presentation LLO 11.2 Insert pictures text/images/shapes in slide LLO 11.3 Use pictures text/images/shapes editing options.	11	*Make Slide Show Presentation.	2	CO4
LLO 12.1 Add tables and charts in the slides. LLO 12.2 Run slide presentation in different modes LLO 12.3 Print slide presentation as handouts/notes	12	*Use Tables and Charts in Slide	2	CO4
LLO 13.1 Apply animation effects to the text and slides LLO 13.2 Add/set audio and video files in the presentation.	13	*a) Insert Animation effects to Text and Slides. b) Insert Audio and Video files in presentation	2	CO4
LLO 14.1 Configure internet connection on a computer system LLO 14.2 Use different web services on internet	14	a) Internet connection configuration b) Use Internet and Web Services.	1	CO5
LLO 15.1 Configure different browser settings LLO 15.2 Use browsers for the given purpose	15	Working with Browsers.	1	CO5
LLO 16.1 Create web forms for survey using different options.	16	*Prepare Web Forms for Survey.	1	CO5
LLO 17.1 Create web forms for Quiz using different options	17	*Prepare Web Forms for Quiz	1	CO5
Note : Out of above suggestive LLOs - <ul style="list-style-type: none"> *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)

Self Learning

- Following are some suggestive self-learning topics: 1) Use ChatGPT/any other AI tool to explore information. 2) Use Calendar to Schedule and edit activities. 3) Use Translate app to translate the given content from one language to another. 4) Use cloud based storage drive to store and share your files.

Micro project

- The microproject has to be industry application based, internet-based, workshop-based, laboratory-based or field-based as suggested by Teacher. 1) Perform a survey on various input and output devices available in market and make its report. 2) Prepare Time Table, Prepare Notes on Technical Topics, Reports, Biodata with covering letter (Subject teacher shall assign a document to be prepared by each students) 3) Prepare slides with all Presentation features such as: classroom presentation, presentation about department, presentation of Technical Topics. (Subject teacher shall assign a presentation to be prepared by each student). 4) Student Marksheet, Prepare Pay bills, tax statement, student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student). 5) Carry-out Survey on different web browsers. 6) Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.

FUNDAMENTALS OF ICT**Course Code : 311001****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 judicious 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	a) Computer System with all necessary Peripherals and Internet connectivity. b) Any Office Software c) Any Browser (Any General Purpose Computer available in the Institute)	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 Computer System	CO1	2	0	0	0	0
2	II	Word Processing	CO2	3	0	0	0	0
3	III	Spreadsheets	CO3	3	0	0	0	0
4	IV	Presentation Tool	CO4	4	0	0	0	0
5	V	Basics of Internet and Emerging Technologies	CO5,CO6	3	0	0	0	0
Grand Total				15	0	0	0	0

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Lab performance, Assignment, Self-learning and Seminar/Presentation

Summative Assessment (Assessment of Learning)

- Lab. Performance, viva voce

XI. SUGGESTED COS - POS MATRIX FORM

FUNDAMENTALS OF ICT**Course Code : 311001**

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	-	-	-	-	-	1			
CO2	-	-	-	3	-	-	1			
CO3	-	2	1	3	-	-	1			
CO4	-	-	-	3	-	-	1			
CO5	1	-	-	3	-	-	3			
CO6	1	-	-	3	-	-	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	Goel, Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller, Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro, Felix	Linux: Easy Linux for Beginners	CreatevSpace Independent Publishing Platform- 2016, ISBN-13: 978-1533683731
4	Johnson, Steve	Microsoft Office 2010: On Demand	Pearson Education, New Delhi India, 2010. ISBN :9788131770641
5	Schwartz, Steve	Microsoft Office 2010 for Windows: Visual Quick Start	Pearson Education, New Delhi India, 2012, ISBN : 9788131766613
6	Leete, Gurdy, Finkelstein Ellen, Mary Leete	OpenOffice.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.microsoft.com/en-in/learning/office-training.aspx	Office
2	http://www.tutorialsforopenoffice.org/	Open Office
3	https://s3-ap-southeast-1.amazonaws.com/r4ltue295xy0d/Special_Edition_Using_StarOffice_6_0.pdf	Open Office
4	https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf	Computer Fundamental
5	http://www.tutorialsforopenoffice.org/	Open Office
6	https://www.tutorialspoint.com/computer_fundamentals/index.htm	Computer Fundamental
7	https://www.tutorialspoint.com/word/	Word Processing
8	https://www.javatpoint.com/ms-word-tutorial	Word Processing
9	https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847	Word Processing
10	https://www.javatpoint.com/excel-tutorial	Spreadsheet

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Sr.No	Link / Portal	Description
11	https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb	Spreadsheet
12	https://www.javatpoint.com/powerpoint-tutorial	Powerpoint Presentation
13	https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b	Powerpoint Presentation
14	https://www.geeksforgeeks.org/ms-dos-operating-system/	Operating System
15	https://www.javatpoint.com/windows	Windows Operating System
16	https://www.javatpoint.com/what-is-linux	Linux Operating System
17	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT	IoT
18	https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/	IoT
19	https://www.javatpoint.com/machine-learning	AI & Machine Learning
20	https://www.skillrary.com/blogs/read/introduction-to-drone-technology	Drone Technology
21	https://www.cnet.com/tech/computing/what-is-3d-printing/	3D Printing
22	https://support.google.com/a/users/answer/9389764?hl=en	Apps
<p>Note :</p> <ul style="list-style-type: none"> Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students 		

MSBTE Approval Dt. 01/10/2024**Semester - 1, K Scheme**

YOGA AND MEDITATION**Course Code : 311003**

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/ 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/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX
Semester	: First
Course Title	: YOGA AND MEDITATION
Course Code	: 311003

I. RATIONALE

Diploma Graduate needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Yoga and Meditation brings about the holistic development of an individual and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to yoga practice as this will help them in studies as well as his professional life. Moreover, Yoga inculcates discipline in all walks of the life of student. Pranayama practice regulates breathing practices of the student to improve stamina, resilience. Meditation empowers a student to focus and keep calm to get peace of mind. World Health Organization (WHO) has also emphasized the role of yoga and meditation as stress prevention measure. National Education Policy -2020 highlights importance of yoga and meditation amongst students of all ages. Therefore, this course for Diploma students is designed for the overall wellbeing of the student and aims to empower students to adopt and practice "Yoga" in daily life .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Practice basic Yoga and Pranayama in daily life

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
- CO2 - Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CO3 - Follow healthy diet and hygienic practices for maintaining good health.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

YOGA AND MEDITATION**Course Code : 311003**

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Paper Duration	Assessment Scheme									
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				CL	TL	LL			FA-TH			SA-TH	Total	Practical		SLA					
														FA-PR	SA-PR	Max	Min		Max	Min	
311003	YOGA AND MEDITATION	YAM	VEC	-	-	1	1	2	1	-	-	-	-	-	25	10	-	-	25	10	50

Total IKS Hrs for Sem. : 1 Hrs

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

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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 Practice warming up for Yoga.	1	Introduction :- Presentations on Introduction to Yoga and its History. Lab Exp: 1. Perform warming up exercises to prepare the body from head to toe for Yoga.	5	CO1
LLO 2.1 Practice Surya Namaskar	2	Lab Exp: 2. Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Lab Exp 3. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Experiment 2 to 4 must be followed by shavasana for self relaxation.	7	CO1 CO2
LLO 3.1 Practice basic Asanas	3	Lab Exp: 4 Perform Sarvangasna, Halasana, Kandharasana (setubandhasana) Lab Exp: 5 Perform Bhujangasana, Naukasana, Mandukasana Lab Exp: 6 Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Lab Exp: 7 Perform Veera Bhadrasana, Vrukshasana, Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation	8	CO2

YOGA AND MEDITATION**Course Code : 311003**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Practice basic pranayama	4	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhathi Pranayam Kriya Lab Exp:10 Practice Bhramary Pranayam.	5	CO3
LLO 5.1 Practice meditation	5	Lab Exp: 11 Perform sitting in Dhyam Mudra and meditating. Start with five minute and slowly increasing to higher durations. (Trainer will explain the benefits of Meditation before practice)	5	CO3

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**

- Maintain a diary indicating date wise practice done by the student with a photograph of self in yogic posture.

Assignment

- Prepare Diet and nutrition chart for self

Self Learning

- Practice at least thrice a week.
- Read books on different methods to maintain health, wellness and to enhance mood
- Watch videos on Yoga Practices.

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	Yoga and Meditation kits : Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, Cloth Straps, Bolsters, Wheels	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE

YOGA AND MEDITATION**Course Code : 311003****X. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

- Lab performance, Self-learning and Terms work

Summative Assessment (Assessment of Learning)

- Actual Practical Performance

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	-	-	-	-	3	-	-			
CO2	-	-	-	-	3	-	-			
CO3	-	-	-	-	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	Swami Vivekananda	Patanjalis Yoga Sutras	Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017
2	Luisa Ray, Angus Sutherland	Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me	Vital Life Books (2022) ISBN-13?: ? 978-1739737009
3	Swami Saradananda	Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your	Watkins Publishing (2019) ISBN-13?: ? 978-1786782786
4	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	The Relaxation and Stress Reduction Workbook	A New Harbinger Self-Help Workbook (2019)
5	Ann Swanson	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice	ISBN-13?: ? 978-1465479358

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://onlinecourses.swyam2.ac.in/aic19_ed28/preview-introduction to Yoga and Applications of Yog	Yoga and Applications of Yoga
2	https://onlinecourses.swyam2.ac.in/aic23_ge09/preview	Yoga for Creativity
3	https://onlinecourses.swyam2.ac.in/aic23_ge05/preview	Yoga for concentration

YOGA AND MEDITATION**Course Code : 311003**

Sr.No	Link / Portal	Description
4	https://onlinecourses.swayam2.ac.in/aic23_ge06/preview	yoga for memory development
5	https://onlinecourses.nptel.ac.in/noc21_hs29/preview	Psychology of Stress, Health and Well-being
6	https://onlinecourses.swayam2.ac.in/nce19_sc04/preview	Food Nutrition for Healthy Living - Course – Swayam
7	https://www.classcentral.com/course/swayam-fitness-management-	Fitness Management from Swayam

Note :

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

MSBTE Approval Dt. 01/10/2024**Semester - 1, K Scheme**

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005**

Programme Name/s : Automobile Engineering./ Chemical Engineering/ Electrical Engineering/ Electrical Power System/
Food Technology/ Mechanical Engineering/ Mechatronics/ Production Engineering/
Printing Technology/ Polymer Technology

Programme Code : AE/ CH/ EE/ EP/ FC/ ME/ MK/ PG/ PN/ PO

Semester : First

Course Title : ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)

Course Code : 311005

I. RATIONALE

Workshop Practice is a basic engineering course. The knowledge of basic shops like wood working, fitting, welding, plumbing and sheet metal shop is essential for technician to perform his/her duties in industries. Students are able to perform various operations using hand tool equipment and machineries in various shops. Working in workshop develops the attitude of group working and safety awareness. This course provides industrial environment in the educational institute.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use different engineering tools for performing shop floor activities.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use firefighting tools and equipment.
- CO2 - Prepare job using different tools in fitting shop.
- CO3 - Perform various operations using plumbing and carpentry tools.
- CO4 - Prepare various welding joints.
- CO5 - Produce simple job using different sheet metal operations.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TL				Based on SL			
				CL	TL	LL					Practical			FA-PR		SA-PR		SLA			
				Max	Max	Max	Min	Max			Min	Max	Min	Max	Min	Max	Min				
311005	ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)	EWP	SEC	-	-	4	-	4	2	-	-	-	-	-	50	20	50@	20	-	-	100

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005****Total IKS Hrs for Sem. : 2 Hrs**

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Follow safety practices TLO 1.2 Explain the different types of fire extinguisher and their uses TLO 1.3 Use firefighting equipment TLO 1.4 Locate various machines and equipment in workshop TLO 1.5 Follow good housekeeping	Unit - I General Workshop Practice 1.1 Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols 1.2 First Aid 1.3 Fire, Causes of Fire, Basic ways of extinguishing the fire,Classification of fire, Class A,B,C,D, Firefighting equipment, fire extinguishers, and their types . 1.4 Workshop Layout 1.5 Issue and return system of tools, equipment and consumables	Demonstration Collaborative learning Role Play
2	TLO 2.1 Identify fitting tools TLO 2.2 Explain operation of fitting shop machines TLO 2.3 Use fitting tools TLO 2.4 Operate machineries. TLO 2.5 Perform fitting operations TLO 2.6 Maintain tools, equipment and machineries.	Unit - II Fitting 2.1 Fitting hand tools bench vice, hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block , steel rule, twist drills, reamers, tap set, die set and their Specifications 2.2 Operation of fitting shops machineries - Drilling machine, Power saw, grinder their specifications and maintenance. 2.3 Basic process chipping, filling, scraping, grinding, marking, sawing, drilling, tapping, dieing, reaming etc.	Model Demonstration

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Identify plumbing tools. TLO 3.2 Explain operation of fitting shop machines. TLO 3.3 Use plumbing tools TLO 3.4 Operate machineries. TLO 3.5 Perform plumbing operations TLO 3.6 Maintain tools, equipment and machineries.	Unit - III Plumbing 3.1 Plumbing hand tools pipe vice, pipe bending equipment, pipe wrenches, dies and their Specifications 3.2 Pipe fittings- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple and their Specifications 3.3 Operation of Machineries in plumbing shops- pipe bending machine their specifications and maintenance. Basic process cutting, threading.	Model Demonstration
4	TLO 4.1 Identify metal joining tools. TLO 4.2 Explain gas and arc welding procedure TLO 4.3 Use metal joining tools. TLO 4.4 Perform welding, soldering, brazing operations TLO 4.5 Maintain tools, equipment and machineries.	Unit - IV Metal Joining 4.1 Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter and their Specifications 4.2 Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush and their Specifications 4.3 Operation of machineries in welding shops- arc welding transformer their specifications and maintenance. 4.4 Welding Electrode, filler rod, fluxes, and solders. 4.5 Basic process welding, brazing and soldering.	Video Demonstrations Demonstration
5	TLO 5.1 Select wood working tools as per job/ requirement. TLO 5.2 Explain operation of wood working machines TLO 5.3 Use furniture making tools TLO 5.4 Operate machineries. TLO 5.5 Perform wood working operations TLO 5.6 Maintain tools, equipment and machineries.	Unit - V Carpentry 5.1 Types of artificial woods such as plywood, block board, hardboard, laminated boards, Veneer, fiber Boards and their applications. 5.2 Wood working hand tools carpentry vice, marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares, and their specifications 5.3 Operation of wood working machineries - Wood turning lathe, circular saw, their specifications and maintenance. 5.4 Basic process- marking, sawing, planning, chiseling, turning, grooving, boring.	Demonstration
6	TLO 6.1 Identify sheet metal tools. TLO 6.2 Explain operation of sheet metal machineries. TLO 6.3 Use sheet metal tools TLO 6.4 Operate sheet metal machineries. TLO 6.5 Perform bending operations TLO 6.6 Maintain tools, equipment and machineries.	Unit - VI Sheet Metal 6.1 Sheet metal hand tools snip, shears sheet gauge, straight edge, L square, scribe, divider, trammel, punches, pliers, stakes, groovers, limit set and their Specifications 6.2 Operation of machineries in sheet metal shops- sheet cutting and bending machine their specifications and maintenance. Basic process- marking, bending, folding, edging, seaming, staking, riveting.	Demonstration

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

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Use fire extinguisher	1	Identify fire extinguisher according to their specification.	2	CO1
LLO 2.1 Operate fire extinguisher	2	* Perform mock drill session in group of minimum 10 students for extinguishing fire.	2	CO1
LLO 3.1 Identify different tools used in workshop.	3	* Identify different tools used in workshop.	2	CO1 CO2 CO3 CO4 CO5
LLO 4.1 Select proper fitting tools LLO 4.2 Prepare fitting job using different tools.	4	* Prepare job using following operations:part1 a. Marking operation as per drawing b. punching operation as per drawing c. Filing operation as per drawing d. sawing operation as per drawing e. drilling operation as per drawing f. tapping operation as per drawing	6	CO2
LLO 5.1 Select proper plumbing tools LLO 5.2 Use plumbing operations for preparing plumbing joints	5	Prepare T joint pipe fitting job as per given drawing (individually)	4	CO3
LLO 6.1 Select proper plumbing tools LLO 6.2 Use plumbing operations for preparing plumbing joints	6	* Prepare elbow joint pipe fitting job as per given drawing(individually)	4	CO3
LLO 7.1 Develop list of different components as per the specification.	7	* Prepare bill of material for given pipeline layout (individually)	2	CO3
LLO 8.1 Obey safety rules employed in welding shop.	8	* Practice different safety rules in welding shop as per given instruction.	2	CO4
LLO 9.1 Prepare various welded joints using different welding processes.	9	Prepare lap joint using gas welding as per given drawing (individually)	4	CO4
LLO 10.1 Prepare various welded joints using different welding processes.	10	Prepare butt joint using gas welding as per given drawing (individually)	4	CO4
LLO 11.1 Assemble utility jobs using different manufacturing processes.	11	* Prepare utility job (like stool, benches, tables or similar jobs) involving arc welding and artificial wood as per given drawing (in group of 4 to 5 students) Fabrication operation involve measuring, marking, cutting, edge preparation, welding	8	CO3 CO4
LLO 12.1 Select proper sheet metal tools LLO 12.2 Prepare sheet metal component using different operations.	12	* Prepare sheet metal utility job using following operations a. Cutting And Bending b. Edging c. End curling d. Lancing e. Soldering f. Riveting	6	CO5

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 13.1 Collect information about ancient tools for understanding Indian Knowledge.	13	* Draw sketches of various ancient tools	2	CO1 CO2 CO3 CO4 CO5
Note : Out of above suggestive LLOs -				
<ul style="list-style-type: none"> *' 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) : NOT APPLICABLE**VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Fire buckets of standard size.	1,2
2	Fire extinguisher A,B and C types	1,2
3	Wood Turning Lathe Machine, Height of Centre: 200mm, Distance between Centers: 1200mm, Spindle Bore: 20mm with Taper, Range of Speeds: 425 to 2800 with suitable Motor Drive. with all accessories	11
4	Circular Saw Machine, Diameter of saw blade 200 mm, Maximum Depth of Cut 50 mm, Table Size -350 x 450 mm, Table Tilting - 450	11
5	Wood working tools- marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares	11
6	Carpentry Vice 200 mm	11
7	Sheet Bending Machine	12
8	Sheet Cutting Machine	12
9	Brazing Equipment	12
10	Sheet metal hand tools- snip, shears sheet gauge, straight edge, L square, scribe, divider, trammel, punches, pliers, stakes, groovers, limit set	12
11	Fitting tools - hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block, steel rule, twist drills, reamers, tap set, die set.	3,4
12	Plumbing tools- pipe vice, pipe bending equipment, pipe wrenches, dies.	3,5,6
13	Work Benches- size:1800 x 900 x 750 mm	4
14	Bench Drilling machine (upto 13 mm drill cap.) with ½ H.P. Motor, 1000 mm height.	4
15	Power Saw machine 350 mm mechanical with 1 HP Motor & all Accessories.	4
16	Bench Grinder 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore 32 mm. with ½ HP/1HP Motor.	4
17	Portable Hammer Drill Machine 0-13 mm A.C. 230 V, 2.5Amp, Pistol type, having different types of bits	4
18	Surface Plate 600 x 900 mm Grade I	4,5
19	Angle Plate 450 x 450 mm	4,5
20	Vernier height Gauge 450 mm	4,5,6,8
21	Pipe Bending Machine	5,6
22	Pipe Vice – 100 mm	5,6
23	Pipe Cutter- 50 mm	5,6
24	Bench Vice 100 mm	5,6

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
25	Welding machine 20 KVA 400A welding current 300A at 50, 100, 200, 250, 300 with std. Accessories and Welding Cable 400 amp. ISI with holder	8,9,10,11
26	Oxygen and acetylene gas welding and cutting kit with cylinders and regulators.	8,9,10,11
27	Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter	8,9,10,11
28	Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush.	8,9,10,11

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE**X. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

- Assignment and Terms work

Summative Assessment (Assessment of Learning)

- Lab performance

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	3	-	-	2	3	3	1			
CO2	3	-	-	3	2	3	-			
CO3	3	-	-	3	2	3	1			
CO4	3	-	-	3	2	3	1			
CO5	3	-	-	3	2	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	Bawa, H.S.	Workshop Practice	McGraw Hill Education, Noida; ISBN-10: 0070671192 ISBN-13: 978-0070671195
2	Gupta, J.K.; Khurmi, R.S.	A Textbook of Manufacturing Process (Workshop Tech.)	S.Chand and Co. New Delhi ISBN:81-219-3092-8
3	Hegde, R.K.	Workshop Practice Manual For Engineering Diploma & ITI Students	Sapna Book House, 2012, ISBN:13: 9798128005830

ENGINEERING WORKSHOP PRACTICES (Mechanical, Electrical and allied branches)**Course Code : 311005**

Sr.No	Author	Title	Publisher with ISBN Number
4	Singh, Rajender	Introduction to Basic Manufacturing Process & Workshop Technology	New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7
5	Hajra, Choudhary	Elements of Workshop Technology	Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146
6	Sarathe, A.K	Engineering Workshop Practice	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-51-6

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.asnu.com.au	Basic engineering tools.
2	http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf	Wood working
3	http://www.weldingtechnology.org	Welding techniques
4	http://www.newagepublishers.com/samplechapter/001469.pdf	Basic engineering tools.
5	http://www.youtube.com/watch?v=TeBX6cKKHWY	Welding techniques
6	http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related	Welding techniques
7	http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu	Wood working
8	http://www.piehtoolco.com	Basic engineering tools.
9	http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/	Basic engineering tools.
10	https://www.youtube.com/watch?v=9_cnkaAbtCM	Basic engineering tools.

Note :

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

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)**Course Code : 311006**

Programme Name/s : Automobile Engineering./ Agricultural Engineering/ Civil Engineering/ Chemical Engineering/
Civil & Rural Engineering/ Construction Technology/ Fashion & Clothing Technology/
Electrical Engineering/
Electrical Power System/ Food Technology/ Civil & Environmental Engineering/
Mechanical Engineering/
Mechatronics/ Production Engineering/ Printing Technology/ Polymer Technology/
Textile Technology/ Textile Manufactures

Programme Code : AE/ AL/ CE/ CH/ CR/ CS/ DC/ EE/ EP/ FC/ LE/ ME/ MK/ PG/ PN/ PO/ TC/ TX/
Semester : First
Course Title : ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)
Course Code : 311006

I. RATIONALE

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the student. It covers the knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian Standards related to engineering drawing. The curriculum aims at developing the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas into sketches. The course also helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare engineering drawing manually using prevailing drawing instruments.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Draw geometrical figures and engineering curves.
- CO2 - Apply principles of orthographic projections for drawing given pictorial views.
- CO3 - Draw isometric views of given component or from orthographic projections.
- CO4 - Use various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
- CO5 - Draw free hand sketches of given engineering elements.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme										Total Marks	
				Actual Contact Hrs./Week			SL	H	NL		LH	Paper Duration	Theory			Based on LL & TL				Based on SL		
				CL	TL	LL							Total	Practical		SLA						
														FA-TH	SA-TH	FA-PR	SA-PR	Max	Min	Max		Min
311006	ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)	EGR	DSC	2	-	4	-	6	3	-	-	-	-	-	50	20	50@	20	-	-	100	

Total IKS Hrs for Sem. : 2 Hrs

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Prepare drawing using drawing instruments. TLO 1.2 Use IS SP-46 for dimensioning TLO 1.3 Use different types of lines. TLO 1.4 Draw regular geometrical figures. TLO 1.5 Draw figures having tangency constructions.	Unit - I Basic Elements of Drawing 1.1 Drawing Instruments and supporting material: method to use them with applications. 1.2 Standard sizes of drawing sheets (ISO-A series) 1.3 I.S. codes for planning and layout. 1.4 Letters and numbers (single stroke vertical) 1.5 Convention of lines and their applications. 1.6 Scale - reduced, enlarged & full size 1.7 Dimensioning techniques as per SP-46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning 1.8 Geometrical constructions.	Model Demonstration
2	TLO 2.1 Explain different engineering curves with areas of application. TLO 2.2 Draw different conic sections. TLO 2.3 Draw involute and cycloidal curves. TLO 2.4 Draw helix and spiral curves from given data TLO 2.5 Plot Loci of points from given data.	Unit - II Engineering curves & Loci of Points. 2.1 Concept and understanding of focus, directrix, vertex and eccentricity. Conic sections. 2.2 Methods to draw an ellipse by Arcs of circle method & Concentric circles method. 2.3 Methods to draw a parabola by Directrix-Focus method & Rectangle method 2.4 Methods to draw a hyperbola by Directrix-Focus method. 2.5 Methods to draw involutes: circle & pentagon 2.6 Methods to draw Cycloidal curve: cycloid, epicycloid and hypocycloid 2.7 Methods to draw Helix & Archimedean spiral. 2.8 Loci of points on Single slider crank mechanism with given specifications.	Demonstration

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)**Course Code : 311006**

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 Explain methods of Orthographic Projections. TLO 3.2 Draw orthographic views of simple 2D entities containing lines, circles and arcs only. TLO 3.3 Draw the orthographic views from given pictorial views. TLO 3.4 Use of IS code IS SP-46 for dimensioning technique.	Unit - III Orthographic Projections 3.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications.(No question to be asked in examination) 3.2 Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Pr	Model Demonstration Video Demonstrations
4	TLO 4.1 Prepare isometric scale. TLO 4.2 Draw isometric views of simple 2D entities containing lines, circles and arcs only. TLO 4.3 Interpret the given orthographic views. TLO 4.4 Draw Isometric views from given orthographic views	Unit - IV Isometric Projections 4.1 Introduction to Isometric projection. 4.2 Isometric scale and Natural Scale. 4.3 Isometric view and isometric projection. 4.4 Illustrative problems related to simple objects having plain, slanting, cylindrical surfaces and slots on slanting surfaces. 4.5 Conversion of orthographic views into isometric View/projection. (For branches other than mechanical Engineering, the teacher should select branch specific elements)	Model Demonstration Video Demonstrations
5	TLO 5.1 Sketch proportionate freehand sketches of given machine elements. TLO 5.2 Select proper fasteners and locking arrangement.	Unit - V Free Hand Sketches of Engineering Elements 5.1 5.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching)	Model Demonstration

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 Use of drawing instruments	1	* Draw horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. (Sketch Book).	2	CO1
LLO 2.1 Use of IS code related to dimensioning standard	2	* Draw different types of lines, dimensioning styles (Sketch Book)	2	CO1
LLO 3.1 Practice of drawing as per given sketch	3	* Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (Sketch Book)	2	CO1
LLO 4.1 Use IS Standard for drawing different figures	4	* Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (01 Sheet)	4	CO1
LLO 5.1 Identify different Engineering curves	5	* Draw any four Engineering Curves (Sketchbook)	2	CO1
LLO 6.1 Identify different Engineering curves	6	* Draw any four Engineering Curves – (01 Sheet)	4	CO1

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)**Course Code : 311006**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Apply method of projection for drawing simple orthographic views	7	* Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (Sketchbook)	2	CO2 CO4
LLO 8.1 Apply method of projection for drawing simple orthographic views	8	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (01 Sheet)	4	CO2 CO4
LLO 9.1 Apply method of projection for drawing complex orthographic views	9	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)	2	CO2 CO4
LLO 10.1 Apply method of projection for drawing complex orthographic views	10	* Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc.- (01 Sheet)	4	CO2 CO4
LLO 11.1 Draw simple isometric projections	11	* Draw two problems on Isometric view of simple objects having plain and slanting surfaces by using natural scale. (Sketchbook)	2	CO3 CO4
LLO 12.1 Apply different scales for drawing isometric projections.	12	Draw two problems on Isometric view of simple objects having plain and slanting surfaces by using natural scale. (01 sheet)	4	CO3 CO4
LLO 13.1 Draw simple isometric projections	13	Draw two problems on Isometric Projection of objects having cylindrical surfaces and slots on slanting surfaces by using isometric scale.(Sketchbook)	2	CO3 CO4
LLO 14.1 Apply different scales for drawing isometric projections	14	* Draw two problems on Isometric Projection of objects having cylindrical surfaces and slots on slanting surfaces by using isometric scale. (01 sheet)	4	CO3 CO4
LLO 15.1 Draw Orthographic views of a given object.	15	Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketch book).	2	CO2 CO4
LLO 16.1 Draw standard discipline oriented components using free hand .	16	* Draw freehand Sketches of 12 different standard components (Sketch book)	2	CO5
LLO 17.1 Draw standard discipline oriented components using free hand .	17	Draw freehand Sketches of 12 different standard components (1 Sheet)	2	CO5
LLO 18.1 Collect information of an ancient Indian culture related to engineering graphics	18	* Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics	2	CO1 CO2 CO3 CO4 CO5
Note : Out of above suggestive LLOs -				
<ul style="list-style-type: none"> * 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)

-

- not Applicable

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)**Course Code : 311006****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 judicious 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	Models/ Charts of objects mentioned in unit no. 5	16,17
2	Models of objects for orthographic / isometric projections	7,8,9,10,11,12,13,14,15
3	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
4	Set of various industrial drawings being used by industries.	All
5	Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers and made used available on the MSBTE portal to be used as reference/standards.	All
6	Drawing equipment and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squares (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins / clips	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 Elements of Drawing	CO1	3	0	0	6	6
2	II	Engineering curves & Loci of Points.	CO1	6	0	0	6	6
3	III	Orthographic Projections	CO2,CO4	7	0	0	14	14
4	IV	Isometric Projections	CO3,CO4	8	0	0	14	14
5	V	Free Hand Sketches of Engineering Elements	CO4,CO5	6	0	0	10	10
Grand Total				30	0	0	50	50

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Term work

Summative Assessment (Assessment of Learning)

- Practical

XI. SUGGESTED COS - POS MATRIX FORM

ENGINEERING GRAPHICS (Civil, Electrical, Mechanical and allied branches)**Course Code : 311006**

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	3	-	-	2	-	2	-			
CO2	3	-	-	2	-	2	-			
CO3	3	-	-	2	-	2	-			
CO4	3	-	-	2	-	2	-			
CO5	3	-	-	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	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81-7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Pradhan, S.K Jain, K.K	Engineering Graphics	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Free Hand Sketches
2	https://www.youtube.com/watch?v=_MQScnLXL0M	Orthographic Projection
3	https://www.youtube.com/watch?v=3WXPanCq9LI	Basics of Projection
4	https://www.youtube.com/watch?v=fvjk7PlxAuo	Introduction to Engineering Graphics
5	https://www.youtube.com/watch?v=8j711OWhMIE	Isometric Projection

Note :

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

BASIC MATHEMATICS**Course Code : 311302**

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/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Telecommunication 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 Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Textile Manufactures/
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/ PG/ PN/ PO/ SE/ TC/ TE/ TX
Semester	: First
Course Title	: BASIC MATHEMATICS
Course Code	: 311302

I. RATIONALE

Basic Mathematics plays a crucial role in diploma programmes as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques and analytical thinking, which are valuable for lifelong learning and professional growth. Calculus is a branch of Mathematics that calculates how matter, particles and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, velocity and acceleration are also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis which involves the method of collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. It equips individuals with the ability to interpret numerical information, make informed decisions and navigate real-world situations. Moreover, Mathematics provides a foundation for further studies in various disciplines and prepares students to tackle complex challenges. By exploring abstract concepts and logical structures, students develop their ability to reason, make connections, and approach problems with clarity and precision. Furthermore, studying Mathematics helps students appreciate the historical and cultural significance of Mathematics and its applications in diverse fields, thereby fostering mathematical literacy and a deeper understanding of the world. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus and statistics. By incorporating these topics, students comprehend to approach engineering problems from a mathematical perspective, enabling them to devise efficient and effective solutions and this leads to preparing Diploma graduates well-rounded, adaptable and capable of making significant contributions to the branch-specific problems.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply the concept of Mathematics to solve industry-based technology problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

MSBTE Approval Dt. 01/10/2024

Semester - 1, K Scheme

BASIC MATHEMATICS**Course Code : 311302**

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

- CO1 - Apply the concepts of algebra to solve engineering (discipline) related problems.
- CO2 - Utilize trigonometry to solve branch specific engineering problems.
- CO3 - Solve area specific engineering problems under given conditions of straight lines.
- CO4 - Apply differential calculus to solve discipline specific problems.
- CO5 - Use techniques and methods of statistics to crack discipline specific problems.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory			Based on LL & TL				Based on SL			
				CL	TL	LL					Practical			FA-PR		SA-PR		SLA			
											FA-TH	SA-TH	Total	Max	Min	Max	Min	Max	Min		
311302	BASIC MATHEMATICS	BMS	AEC	4	2	-	2	8	4	3	30	70	100	40	-	-	-	-	25	10	125

Total IKS Hrs for Sem. : 6 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	<p>TLO 1.1 Solve the given simple problem based on laws of logarithm.</p> <p>TLO 1.2 Solve given system of linear equations using matrix inversion method.</p> <p>TLO 1.3 Obtain the proper and improper partial fraction for the given simple rational function.</p> <p>TLO 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics.</p>	<p>Unit - I Algebra</p> <p>1.1 Logarithm: Concept and laws of logarithm.</p> <p>1.2 Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3x3, adjoint and inverse of matrices.</p> <p>1.3 Matrices: Solution of simultaneous equations by matrix inversion method.</p> <p>1.4 Partial Fractions: Types of partial fraction based on nature of factors and related Problems.</p> <p>1.5 Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics)..</p>	<p>Improved Lecture</p> <p>Tutorial</p> <p>Assignment</p> <p>Demonstration</p> <p>Simulation</p>

BASIC MATHEMATICS**Course Code : 311302**

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	<p>TLO 2.1 Apply the concept of Compound angle, allied angle and multiple angles to solve the given simple engineering problem(s).</p> <p>TLO 2.2 Apply the concept of Sub-multiple angle to solve the given simple engineering related problem(s).</p> <p>TLO 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s).</p> <p>TLO 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios.</p> <p>TLO 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.</p>	<p>Unit - II Trigonometry</p> <p>2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles. (without proof)</p> <p>2.2 Factorization and De factorization formulae. (without proof).</p> <p>2.3 Inverse Trigonometric Ratios and related problems.</p> <p>2.4 Principle values and relation between trigonometric and inverse trigonometric ratios.</p> <p>2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India.</p> <p>2.6 Indian Trigonometry: Basic Indian Trigonometry- Introduction and Terminology (From Ancient Beginnings to Nilakantha).</p> <p>2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.</p>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach</p>
3	<p>TLO 3.1 Calculate angle between given two straight lines.</p> <p>TLO 3.2 Formulate equation of straight lines related to given engineering problems.</p> <p>TLO 3.3 Identify perpendicular distance from the given point to the line.</p> <p>TLO 3.4 Calculate perpendicular distance between the given two parallel lines.</p> <p>TLO 3.5 Use geometry given in Sulabasutras to solve the given problems.</p>	<p>Unit - III Straight Line</p> <p>3.1 Straight line and slope of straight line: Angle between two lines, Condition of parallel and perpendicular lines.</p> <p>3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form.</p> <p>3.3 Perpendicular distance from a point on the line.</p> <p>3.4 Perpendicular distance between two parallel lines.</p> <p>3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).</p>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation</p>
4	<p>TLO 4.1 Solve the given simple problems based on functions.</p> <p>TLO 4.2 Solve the given simple problems based on rules of differentiation.</p> <p>TLO 4.3 Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, exponential functions.</p> <p>TLO 4.4 Apply the concept of differentiation to find given equation of tangent and normal.</p> <p>TLO 4.5 Apply the concept of differentiation to calculate maxima, minima and radius of curvature for given function.</p> <p>TLO 4.6 Familiar with concept of calculus given in Indian Mathematics.</p>	<p>Unit - IV Differential Calculus</p> <p>4.1 Functions and Limits: Concept of function and simple examples.</p> <p>4.2 Functions and Limits: Concept of limits without examples.</p> <p>4.3 Derivatives: Rules of derivatives such as sum, Product, Quotient of functions.</p> <p>4.4 Derivatives: Derivative of composite functions (chain Rule), implicit and parametric functions.</p> <p>4.5 Derivatives: Derivatives of inverse, logarithmic and exponential functions.</p> <p>4.6 Applications of derivative: Second order derivative without examples, Equation of tangent and normal, Maxima and minima, Radius of curvature.</p> <p>4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.(Indian Mathematics).</p>	<p>Improved Lecture Tutorial Assignment Demonstration Simulation</p>

BASIC MATHEMATICS**Course Code : 311302**

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 Obtain the range and coefficient of range of the given grouped and ungrouped data. TLO 5.2 Calculate mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s). TLO 5.3 Determine the variance and coefficient of variance of given grouped and ungrouped data. TLO 5.4 Justify the consistency of given simple sets of data.	Unit - V Statistics 5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from mean of grouped and ungrouped data. 5.3 Variance and coefficient of variance. 5.4 Comparison of two sets of observation.	Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach

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 Solve simple problems of Logarithms based on given applications.	1	Solve simple problems of Logarithms based on given applications.	2	CO1
LLO 2.1 Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	2	Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	2	CO1
LLO 3.1 Apply the concept of matrix to solve engineering problems.	3	Solve solution of Simultaneous Equation using inversion method.	2	CO1
LLO 4.1 Apply the concept of matrix to solve engineering problems.	4	Apply Matrix Inversion method to determine currents through various branches of given electrical networks.	2	CO1
LLO 5.1 Apply the concept of matrix to solve engineering problems.	5	Determine inverse of a non-singular matrix by using open source software.	2	CO1
LLO 6.1 Apply the concept of partial fraction to solve engineering problems.	6	Resolve into partial fraction using linear non-repeated, repeated, and irreducible quadratic factors.	2	CO1
LLO 7.1 Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes.	7	Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes.	2	CO2
LLO 8.1 Utilize the concept of trigonometry to solve engineering problems.	8	Practice problems on factorization and de factorization.	2	CO2
LLO 9.1 Utilize the concept of trigonometry to solve engineering problems.	9	Solve problems on inverse trigonometric ratios based on applications.	2	CO2
LLO 10.1 Solve branch specific engineering problems under given conditions of straight lines.	10	Practice problems on equation of straight lines using different forms.	2	CO3
LLO 11.1 Solve branch specific engineering problems under given conditions of straight lines.	11	Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines.	2	CO3
LLO 12.1 Solve branch specific engineering problems under given conditions of straight lines.	12	Use given form of straight line to calculate the speed, distance and time of moving object.	2	CO3

BASIC MATHEMATICS**Course Code : 311302**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 13.1 Apply the concept of derivative to solve engineering problems.	13	Solve problems to find derivatives of implicit function and parametric function.	2	CO4
LLO 14.1 Apply the concept of derivative to solve engineering problems.	14	Solve problems to find derivative of logarithmic and exponential functions for engineering applications.	2	CO4
LLO 15.1 Apply the concept of equation of tangent and normal to solve engineering problems.	15	Solve problems based on finding equation of tangent and normal for engineering applications.	2	CO4
LLO 16.1 Apply the concept of maxima, minima and radius of curvature to solve engineering problems.	16	Solve problems based on finding maxima, minima of function and radius of curvature at a given point for engineering applications.	2	CO4
LLO 17.1 Apply the concept of equation of tangent and normal to solve engineering problems.	17	Use the concept of tangent and normal to solve the given problem of Engineering Drawing.	2	CO4
LLO 18.1 Apply the concept of Maxima and Minima to solve engineering problems.	18	Use the concept of Maxima and Minima to obtain optimum value for given engineering problem.	2	CO4
LLO 19.1 Apply the concept of radius of curvature to solve engineering problems.	19	Use the concept of radius of curvature to solve given branch specific engineering problem.	2	CO4
LLO 20.1 Utilize the concept of derivative to solve engineering problems.	20	Use the concept of derivative to find the slope of a bending curve for given engineering problem.	2	CO4
LLO 21.1 Use concept of range and mean deviation to crack branch specific problems.	21	Solve problems on finding range, coefficient of range and mean deviation for given applications.	2	CO5
LLO 22.1 Use concept of standard deviation and coefficient of variance to crack branch specific problems.	22	Solve problems on standard deviation, coefficient of variation and comparison of two sets.	2	CO5
LLO 23.1 Use concept of standard deviation to crack branch specific problems.	23	Calculate the Standard Deviation for Concrete with the given data for given engineering applications.	2	CO5

Note : Out of above suggestive LLOs -

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

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

- Create a function that takes a matrix as input and returns its inverse matrix if it exists. Also Implement a program that finds the inverse of a square matrix.
- Collect the Data of Marks obtained by your class in mid sem test. Compute the variance and coefficient of variance of the data and interpret the result using the free open source software ORANGE.
- Prepare models using matrices to solve simple problems based on cryptography.
- Collect Model on quality control analysis, energy efficiency assessment, environmental monitoring, and process optimization, for these models, analyze data and calculate variance and standard deviation, make a presentation including short videos.

BASIC MATHEMATICS**Course Code : 311302**

- Prepare the model using the concept of tangent and normal bending of roads in case of sliding of a vehicle, express geometrically the same through any open source software.
- Prepare the model using the concept of radius of curvature to bending of railway tracks, express geometrically the same through any open source software.
- A window in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window to admit maximum light through the whole opening, prepare a model using concept of Maxima and Minima for the above problem and verify the result.
- Visualize trigonometric waveforms and create animations utilizing sine or cosine functions and make a presentation.
- Develop a program of trigonometric function calculator that computes sine, cosine, and tangent values.
- Collect applications of the radius of curvature on lens design and optics, mirror and reflective surface properties, road and highway design, structural behavior, roller coaster track design, and composite material manufacturing and make a video of 5-minutes duration.
- Prepare models using trigonometry based on at least 10 engineering problems.
- Apply trigonometric principles to calculate angles, distances, forces, and dimensions relevant to the chosen area and make a poster presentation.
- Prepare charts using determinant to find area of regular shapes.
- Design a puzzle based on matrices. Create a grid of numbers and operations.
- Develop a math game based on operations of matrices.
- Use matrices as a tool for music composition. Assign different musical elements (e.g., notes, chords, rhythms) to matrix elements, and experiment with combining and transforming the matrices to create unique musical compositions. You can use musical notation open software or even traditional instruments to bring your compositions to life.
- Attempt any 10-12 Micro Projects, out of the given list.

Assignment

- Collect examples based on real world applications of logarithm and prepare a pdf file.
- Solve the simultaneous system of equation in two variables by Matrix Inversion Method. Write down a Mathematical programming using any open source software to verify the result.
- Collect an examples on coding theory using applications of matrices and prepare a pdf file.
- Represent the Graph of Trigonometric function, Logarithmic function on Geogebra and interpret the nature of graph and Make a pdf file.
- Measure height of trees in surrounding locations using trigonometry and prepare presentation.
- Find the derivative of $y = x^{\sin x}$ and visualize the graph of the function and its derivative using any open source software geometrically.
- Find height of room or distance between two pillars by using concept of straight line.
- Collect at least 10 examples based on real world applications of standard deviation/variance.
- Collect at least 10 examples based on real world uses of applications of derivative.
- Attempt any 5-7 Assignment, out of the given list.

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 judicious 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

BASIC MATHEMATICS**Course Code : 311302**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Open-source software like SageMaths, MATHS3D, GeoGebra, Graph, DPLOT, and Graphing Calculator (Graph Eq 2.13), ORANGE can be used for Algebra, Calculus, Trigonometry, and Statistics respectively.	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	Algebra	CO1	12	2	6	6	14
2	II	Trigonometry	CO2	16	2	6	6	14
3	III	Straight Line	CO3	6	2	2	4	8
4	IV	Differential Calculus	CO4	16	2	8	10	20
5	V	Statistics	CO5	10	2	6	6	14
Grand Total				60	10	28	32	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Tests
- Rubrics for COs Assignment
- Midterm Exam
- Self-learning
- Term Work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End Term Exam
- Micro-project
- Tutorial Performance

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	3	1	-	1	-	1	1			
CO2	3	1	-	-	1	1	1			
CO3	3	-	-	-	-	-	-			
CO4	3	1	1	1	-	1	-			
CO5	3	2	1	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

MSBTE Approval Dt. 01/10/2024

Semester - 1, K Scheme

BASIC MATHEMATICS**Course Code : 311302**

Sr.No	Author	Title	Publisher with ISBN Number
1	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi , 2013 ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN: 9788121903455
5	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency, New Delhi 110016. ISBN 978-93-80250-06-9
7	George Gheverghese Joseph	Indian Mathematics Engaging with the World from Ancient to Modern Times	World Scientific Publishing Europe Ltd. 57 ISBN 978-17-86340-61-0
8	Deepak Singh	Mathematics-I	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-42-4
9	Garima Singh	Mathematics-II	Khanna Book Publishing Co. (P) Ltd. ISBN: 978-93-91505-52-3
10	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)
11	Gunakar Muley	Sansar Ke Mahan Ganitagya	First Edition, Rajkamal Prakashan, ISBN-10. 8126703571, ISBN-13. 978-8126703579.
12	T.S. Bhanumurthy	A Modern introduction to Ancient Indian Mathematics	New Age International Private Limited, 1 January 2008 ISBN- 10. 812242600X, ISBN- 13. 978-8122426007
13	M.P. Trivedi and P.Y. Trivedi	Consider Dimension and Replace Pi	Notion Press; 1st edition (2018), ISBN-978-1644291795

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	www.scilab.org/ -SCI Lab	Signal processing, statistical analysis, image enhancement.
3	www.mathworks.com/product/matlab/ -MATLAB	Applications of concepts of Mathematics to coding.
4	Spreadsheet Applications	Use of Microsoft Excel, Apple Numbers, Google Sheets.
5	https://ocw.mit.edu/	MIT Course ware
6	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
7	http://ocw.abu.edu.ng/courses/mathematics/	List of Mathematical Courses.
8	https://libguides.furman.edu/oer/subject/mathematics	Open Education Resources (OER) in Mathematics.
9	https://phet.colorado.edu/en/simulations/filter?subjects=math&type=html,prototype	Phet Simulation for Mathematics.
10	https://libguides.cmich.edu/OER/mathematics	Mathematics with OER.

BASIC MATHEMATICS**Course Code : 311302**

Sr.No	Link / Portal	Description
Note :		
<ul style="list-style-type: none">Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

MSBTE Approval Dt. 01/10/2024**Semester - 1, K Scheme**

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

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	: First
Course Title	: COMMUNICATION SKILLS (ENGLISH)
Course Code	: 311303

I. RATIONALE

The most commonly used medium to express oneself is language. English being a global language is used in all spheres of human life i.e. personal, professional and social. English Language proficiency focuses on strong reading, writing, speaking and listening skills. It will include grammar, vocabulary, comprehension and describing skills to enhance overall language proficiency. English for professional purposes aim to equip the students with necessary language skills required for Public Speaking, presentation and negotiation. English for academic purposes will include academic writing skills and critical thinking considering the need of students to communicate in engineering domain.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to achieve the following industry identified outcome through various learning experiences: "Communicate in written and oral form of English effectively at workplace".

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Construct grammatically correct sentences in English.
- CO2 - Compose paragraphs and dialogues on given situations
- CO3 - Comprehend passages correctly.
- CO4 - Use contextual words in English appropriately
- CO5 - Deliver effective presentations in English using appropriate body language

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

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
				CL	TL	LL					Practical		FA-PR		SA-PR		SLA				
							FA-TH	SA-TH			Total	Max	Min	Max	Min	Max	Min	Max	Min		
311303	COMMUNICATION SKILLS (ENGLISH)	ENG	AEC	3	-	2	1	6	3	3	30	70	100	40	25	10	-	-	25	10	150

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 Use transcription to pronounce words correctly. TLO 1.2 Use prefix and suffix for flexibility and precision in language TLO 1.3 Employ synonyms and antonyms to express similarity and contrast between words. TLO 1.4 Use Homophones to expand their vocabulary TLO 1.5 Make use of the collocations correctly	Unit - I Vocabulary 1.1 Phonetics : Vowels(12) Consonants (24) Diphthongs (8) 1.2 Prefix & Suffix : . Definition & Examples , List of common prefixes and suffixes 1.3 Synonyms & Antonyms : Vocabulary expansion , Context & Usage 1.4 Homophones : Identifying Homophones , Meaning & Context , Vocabulary Expansion 1.5 Collocations : Definition & identification , Types of collocations	Language Lab Drill Classroom learning Reference Books NPTEL
2	TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic TLO 2.2 Develop dialogues to practice language skill in a structured and meaningful way.	Unit - II Paragraph and Dialogue Writing 2.1 Types of paragraphs: Technical , Descriptive , Narrative 2.2 Dialogue Writing: i Greetings ii. Development iii. Closing Sentence	Classroom learning Skit Language Lab YouTube videos

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

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 Respond to the given questions of the specified passage. TLO 3.2 Formulate sentences using new words TLO 3.3 Use correct syntax to construct meaningful sentences for the given situation. TLO 3.4 Respond to the questions on the given seen & unseen passages.	Unit - III Comprehension (Seen and Unseen Passages) 3.1 1 Passages from MSBTE workbook 1.Say No to Plastic bags 2.Interview of Dr. APJ Abdul Kalam 3.Maximum Achievements 4.Be Remarkable 5.Arunima Sinha: A Biography 6.Roses of Gratitude 3.2 Importance of Comprehension 3.3 Unseen Passages 3.4 Interpretation of passages in written and Spoken form	Classroom learning interactive session Discussion
4	TLO 4.1 Describe technical objects with specifications TLO 4.2 Explain the given picture in grammatically correct language. TLO 4.3 Diary Entry on situations TLO 4.4 Translate from English to Marathi/Hindi- vice versa	Unit - IV Communicative Language 4.1 Technical objects : i. Heading ii. Description of technical objects 4.2 Picture Description : i. Situational picture ii. Describe in your own words 4.3 Diary Entry : i. Date ii. Content iii. Name of the writer 4.4 Translation of paragraph from English to Marathi/Hindi-Vice versa (Question not to be asked on Translation in Theory Examination)	Language Lab Pictures on situations Classroom learning
5	TLO 5.1 Cultivate/Develop habit of being presentable TLO 5.2 Formulate speeches for occasions TLO 5.3 Prepare power point presentation TLO 5.4 Use appropriate body language for effective communication	Unit - V Presentation Skills 5.1 Dressing & Grooming : i. Dressing for the occasion ii. Proper grooming 5.2 Speech Writing : i. Situation ii. Salutations iii. Introduction of the topic iv. Description/Body v. Conclusion 5.3 Power Point Presentation : i. Layout ii. Font size iii. Color combination 5.4 Kinesics : i. Facial expressions ii Eye contact iii Postures iv Gestures	Classroom learning Language Lab

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 Use transcription in correct form LLO 1.2 Learn to differentiate vowel, diphthong and consonants	1	*Write 20 words using phonetic transcription	2	CO1
LLO 2.1 Learn correct pronunciation by using headphones in language lab	2	Practice pronunciation as per IPA using language lab	2	CO1
LLO 3.1 Enhance the understanding of word formation LLO 3.2 Enrich word power LLO 3.3 Construct words with the specific meanings	3	*Formulate 20 words using Prefix and Suffix	2	CO1
LLO 4.1 Use words and phrases effectively LLO 4.2 Enrich vocabulary LLO 4.3 Develop overall language skills	4	*Construct sentences using 20 collocations	2	CO1
LLO 5.1 Articulate ideas clearly and effectively LLO 5.2 Improve grammar, punctuation	5	*Write two paragraphs of 75 words each	2	CO2
LLO 6.1 Add depth to narratives LLO 6.2 Form grammatically correct sentences	6	*Compose situational dialogues (Any Two)	2	CO2

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Promote the development of effective communication skills LLO 7.2 .Improve non -verbal communication Skills LLO 7.3 Enhance interpersonal skills LLO 7.4 Build confidence	7	Enact Role Plays as per situation and context	2	CO5
LLO 8.1 Acquire the ability to convey complex ideas in clear and concise manner LLO 8.2 Expand technical vocabulary LLO 8.3 Enhance the written communication Skills	8	*Describe any three technical objects using correct grammar	2	CO4
LLO 9.1 Develop skills in story telling LLO 9.2 Connect with the audience	9	Narrate anecdotes of various situations in English	2	CO5
LLO 10.1 Notice and articulate specific elements, colors, shapes, & other visual aids LLO 10.2 Express observations & interpretations clearly and concisely LLO 10.3 Enhance vocabulary	10	*Describe a given picture (Any Two)	2	CO4
LLO 11.1 Express information in coherent and engaging manner LLO 11.2 Build confidence	11	*Introduce oneself and others	2	CO5
LLO 12.1 Present complex information in a clear & concise manner LLO 12.2 Develop public speaking skills and presentation skills	12	*Prepare a Power point presentation on a given topic	2	CO5
LLO 13.1 Improve language skills & expand vocabulary	13	*Translate paragraph --English to Marathi/Hindi (vice -Versa) (Any4)	2	CO4
LLO 14.1 Reflect on thoughts, feelings, and experiences	14	*Write your experience in 50 words on (Four) given situations (Diary Entry)	2	CO4
LLO 15.1 Develop language acquisition	15	*Respond to the questions based on the given passages	2	CO3
LLO 16.1 Build confidence in public speaking LLO 16.2 Enhance the skills in planning and prioritization	16	Deliver oral presentations using correct grammar and appropriate body language	2	CO5
Note : Out of above suggestive LLOs -				
<ul style="list-style-type: none"> • *' 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**

- Report different types of episodes/anecdotes
- Seminar preparation and presentations
- Make a Podcast episode based on Indian Freedom Fighters
- Summarize the editorial columns of English newspapers
- Summarize the content of an Eminent person's biography / autobiography
- Write a review on the following: Short stories ,Novels ,Films.
- Prepare a booklet on the contribution of eminent Indian scientists

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

- Prepare a podcast referring ancient literature.
- Prepare blogs, podcast, vlogs
- Prepare a questionnaire & conduct the interview of Industry Personnel, social worker, entrepreneur
- Prepare and participate in debates and extempore speeches

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 judicious 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	Language Lab with relevant software and Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card	All
2	LCD Projector with document reader	All
3	Smart Board with networking	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	Vocabulary	CO1	10	2	4	6	12
2	II	Paragraph and Dialogue Writing	CO2	6	2	4	6	12
3	III	Comprehension (Seen and Unseen Passages)	CO3	16	5	6	13	24
4	IV	Communicative Language	CO4	7	2	4	8	14
5	V	Presentation Skills	CO5	6	2	2	4	8
Grand Total				45	13	20	37	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- -

Summative Assessment (Assessment of Learning)

- -

XI. SUGGESTED COS - POS MATRIX FORM

COMMUNICATION SKILLS (ENGLISH)**Course Code : 311303**

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	1				2	1			
CO2	1	1				2	1			
CO3	1	1				2	1			
CO4	1	1				2	1			
CO5	1	1				2	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	MSBTE	Spectrum, G Scheme and I- Scheme	MSBTE
2	Kumar, E. Suresh, Sreehari, P Savitri	Effective English with CD	Pearson Education
3	Gnanamurli	English Grammar at a Glance	S. Chand
4	CBSE	English Communicative (class X)	Golden
5	Dr. Anjana Tiwari	Communication Skills in English	Khanna Publishers, New Delhi

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in/english/learn-online	Website link is given to refer Unit 1
2	Vocabulary.com	Refer this website for interactive vocabulary quizzes, word lists
3	International Phonetic Association (IPA) Website	It offers audio examples and charts to help understand and transcribe sounds
4	grammarly.com/blog	For constructing effective paragraphs and improving clarity
5	www.newagegolden.com	Refer this website for speech writing, diary entry and paragraph writing

Note :

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

BASIC SCIENCE**Course Code : 311305**

Programme Name/s	: Automobile Engineering./ Artificial Intelligence/ Agricultural Engineering/ Artificial Intelligence and Machine Learning/ Automation and Robotics/ Cloud Computing and Big Data/ Civil Engineering/ Chemical Engineering/ Computer Technology/ Computer Engineering/ Civil & Rural Engineering/ Construction Technology/ Computer Science & Engineering/ Fashion & Clothing Technology/ 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/ Civil & Environmental Engineering/ Mechanical Engineering/ Mechatronics/ Medical Electronics/ Production Engineering/ Printing Technology/ Polymer Technology/ Computer Science/ Textile Technology/ Electronics & Computer Engg./ Textile Manufactures/
Programme Code	: AE/ AI/ AL/ AN/ AO/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DC/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ FC/ HA/ IC/ IE/ IF/ IH/ IS/ LE/ ME/ MK/ MU/ PG/ PN/ PO/ SE/ TC/ TE/ TX
Semester	: First
Course Title	: BASIC SCIENCE
Course Code	: 311305

I. RATIONALE

Diploma engineers have to deal with various materials and machines. This course is designed with fundamental information to help the diploma engineering students to apply the basic concepts and principles of physics and chemistry to solve broad-based engineering problems. The basic concepts and principles of sciences related to heat, electricity, magnetism, optics, semiconductors, engineering materials will help in understanding the technology courses where emphasis is on the applications of these in various technology domain applications

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

This course is to be taught and implemented with the aim to develop in the student, the course outcomes (COs) leading to the attainment of following industry identified outcome expected from this course: Apply principles of physics and chemistry to solve broad based relevant engineering problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use basic instruments to measure the physical quantities in various engineering situations.
- CO2 - Apply the basic principles of electromagnetics to solve given engineering problems.
- CO3 - Apply basic principles of thermometry and fibre optics to solve engineering problems.
- CO4 - Predict the structure, properties and behaviour of molecules and compounds based on the types of chemical bond.
- CO5 - Apply the concepts of electrochemistry and corrosion preventive measures in industry.
- CO6 - Use the appropriate engineering material and catalyst appropriately.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

BASIC SCIENCE**Course Code : 311305**

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory	Based on LL & TL		Based on SL							
				CL	TL	LL						Practical									
				FA-TH	SA-TH	Total	FA-PR	SA-PR				SLA									
Max	Max	Max/Min	Max/Min	Max/Min	Max/Min																
311305	BASIC SCIENCE	BSC	DSC	4	-	4	2	10	5	1.5	30	70*#	100	40	50	20	50@	20	50	20	250

Total IKS Hrs for Sem. : 4 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.

♦ **Candidate remaining absent in practical examination of any one part of Basic Science course i.e. Physics, Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

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.
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BASIC SCIENCE

Course Code : 311305

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	<p>TLO 1.1 Explain physical quantities and its types with examples.</p> <p>TLO 1.2 Differentiate between scalar and vector quantities with examples.</p> <p>TLO 1.3 Apply dimensional analysis to check correctness of equation and conversion of units in different systems .</p> <p>TLO 1.4 Estimate the errors in the measurement for the give problem.</p> <p>TLO 1.5 Explain the working of ancient astronomical instruments to measure distance , time and hour angle .</p> <p>TLO 1.6 Explain the procedure of measuring the dimension of a given object by using vernier calipers and screw gauge .</p>	<p>Unit - I Units and Measurements</p> <p>1.1 Unit, physical quantities: fundamental and derived quantities and their units Systems of units: CGS, MKS and SI .</p> <p>1.2 Scalar and Vector Physical Quantities.</p> <p>1.3 Dimensions, dimensional formula ,Applications of dimensional analysis; correctness of physical equations ,conversion factor for interconversion of units in different systems of units.</p> <p>1.4 Errors, types of errors: instrumental, systematic and random error, estimation of errors: absolute, relative and percentage error, significant figures.</p> <p>1.5 Ancient astronomical instruments:Chakra, Dhanuryatra , Yasti and Phalaka yantra .</p> <p>1.6 Applications of Vernier calipers , Screw gauge .</p>	<p>Chalk and board Improved lecture, Tutorial Assignment Demonstration</p>
2	<p>TLO 2.1 Explain electric field, potential and potential difference.</p> <p>TLO 2.2 Explain magnetic intensity and flux with their units.</p> <p>TLO 2.3 Apply laws of series and parallel combination to the given electrical circuits.Explain the heating effect of electric current.</p> <p>TLO 2.4 Distinguish between conductors, semiconductors and insulators on the basis of energy bands.</p> <p>TLO 2.5 Explain the I-V characteristics and applications of p-n junction diode.</p>	<p>Unit - II Electricity, Magnetism and Semiconductors</p> <p>2.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference.</p> <p>2.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux .</p> <p>2.3 Electric current, Ohm's law, specific resistance, laws of series and parallel combination of resistance, conversion of galvanometer into ammeter and voltmeter, Heating effect of electric current .</p> <p>2.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, minority and majority charge carriers.</p> <p>2.5 p-n junction diode, Depletion layer I-V characteristics of p-n junction, static and dynamic resistance, applications of p-n junction diode ,: Half wave rectifier.</p>	<p>Chalk and board Improved lecture, Tutorial Assignment Demonstration Educational Games</p>

BASIC SCIENCE

Course Code : 311305

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	<p>TLO 3.1 Convert temperature in different temperature scales.</p> <p>TLO 3.2 Compare different modes of heat transfer with examples.</p> <p>TLO 3.3 Inter-relate the characteristics of the three gas laws.</p> <p>TLO 3.4 Inter-relate the characteristics of the three gas laws.</p> <p>TLO 3.5 Explain total internal reflection in optical fiber.</p> <p>TLO 3.6 Differentiate between types optical fiber with applications.</p>	<p>Unit - III Thermometry and Fiber Optics</p> <p>3.1 Heat, temperature, temperature scale: Degree Celsius, degree Kelvin, degree Fahrenheit.</p> <p>3.2 Modes of heat transfer: Conduction , Convection and Radiation , Applications in daily life .</p> <p>3.3 Boyle's law, Charle's law, Gay Lussac's law, perfect gas statements equations and simple numerical.</p> <p>3.4 Law of thermal conductivity ,Newton's law of cooling.</p> <p>3.5 Law of refraction, total internal reflection.</p> <p>3.6 Optical fiber: Principle, construction and working Types of Optical fibers;Single mode step index, Multimode step index, Multimode graded index Applications of optical fibers.</p>	<p>Chalk and board Improved lecture, Tutorial Assignment Demonstration Flip classroom Educational Games</p>
4	<p>TLO 4.1 Explain the properties of given material based on the bond formation.</p> <p>TLO 4.2 Describe the molecular structure of given solid, liquid and gases.</p> <p>TLO 4.3 Describe the crystal structure of the given solids.</p> <p>TLO 4.4 Explain Properties of metallic solid.</p>	<p>Unit - IV Chemical bonding</p> <p>4.1 Indian Chemistry:-Philosophy of atom by Acharya Kanad.</p> <p>4.2 Electronic theory of valency: Assumptions , Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, metallic bond and Intermolecular forces of attraction.</p> <p>4.3 Molecular arrangement in solid, liquid and gases.</p> <p>4.4 Structure of solids: crystalline and amorphous solids ,Properties of metallic solid, Unit cell: simple cubic, body center cubic (BCC) , face centre cubic (FCC), hexagonal close pack crystals.</p>	<p>Simulation, Model Display, Demonstration Chalk and board , PPT, ect</p>

BASIC SCIENCE

Course Code : 311305

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	<p>TLO 5.1 Describe mechanism of electrolysis of CuSO₄ solution by using Cu and Pt rods</p> <p>TLO 5.2 Solve numerical based on Faraday's first and second law of electrolysis.</p> <p>TLO 5.3 Distinguish between primary and secondary cell</p> <p>TLO 5.4 Describe the phenomenon of the given type of corrosion and its prevention.</p> <p>TLO 5.5 Identify the different factors affecting rate of corrosion for the given type of material.</p> <p>TLO 5.6 Select the protective measures to prevent the corrosion in the given corrosive medium.</p>	<p>Unit - V Electro chemistry and Metal Corrosion, its prevention</p> <p>5.1 Electrolyte- Types of electrolyte, ionization and dissociation, Cathode, Anode, Electrode potential: oxidation and reduction, Mechanism of electrolysis: Electrolysis, Electrochemical series for cations and anions. Mechanism of electrolysis of CuSO₄ solution</p> <p>5.2 Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numerical. Applications of electrolysis: Electro-refining of copper and Electroplating.</p> <p>5.3 Difference between primary and secondary cell.</p> <p>5.4 Corrosion: Definition and Types of corrosion Dry corrosion: Mechanism, Types of oxide film, Wet corrosion: Mechanism hydrogen evolution in acidic medium, oxygen absorption in neutral or alkaline medium, Galvanic cell action by Daniel cell.</p> <p>5.5 Factors affecting the rate of corrosion.</p> <p>5.6 Corrosion control: Modification of environment, Use of protective coatings, coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing), Anodic and cathodic protection, Choice of material-using pure metal and using metal alloy</p>	<p>Simulation, Demonstration, Flipped Classroom, Collaborative Learning, Case Study, On-site/Industrial Visit, chalk and board etc.</p>

BASIC SCIENCE**Course Code : 311305**

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.
6	<p>TLO 6.1 Identify the ingredients of the given paints.</p> <p>TLO 6.2 List out salient properties of the given paint and varnish.</p> <p>TLO 6.3 Describe the properties of insulating materials for the given application.</p> <p>TLO 6.4 Differentiate the given types of structural polymers.</p> <p>TLO 6.5 Describe the polymerization process of the given polymer.</p> <p>TLO 6.6 Explain the properties and uses of the given polymer, elastomer and adhesive.</p> <p>TLO 6.7 Describe the application of relevant adhesives required for the given material.</p> <p>TLO 6.8 Suggest the lubricant for various types of machines in industry.</p> <p>TLO 6.9 Select the relevant catalyst for given application.</p>	<p>Unit - VI Engineering Materials and Catalysis</p> <p>6.1 Paints: Purposes of applying paint, Characteristics of paints, Ingredients of paints, Function and examples of each ingredient.</p> <p>6.2 Varnish: Types, Difference between paint and varnishes.</p> <p>6.3 Insulators: Characteristics, Classification, Properties and Application of Glass wool Thermocol.</p> <p>6.4 Polymer and Monomer : Classification on the basis of Molecular structure, on the basis of monomers (homo polymer and copolymer), on the basis of Thermal behavior (Thermoplastics and Thermosetting).</p> <p>6.5 Types Polymerization Reaction, Addition Polymerization, Condensation Polymerization, Synthesis, properties and application of Polyethylene, Polyvinyl chloride, Teflon, Polystyrene, Phenol formaldehyde, Epoxy Resin.</p> <p>6.6 Adhesives: Characteristics, Classification and their uses</p> <p>6.7 Lubricants: Classification, properties and Applications.</p> <p>6.8 Catalysis: Types of catalysis homocatalysis, heterocatalysis.</p> <p>6.9 Catalyst: Types of Catalyst Positive, Negative and Auto-catalyst, Catalytic Promoter and Catalytic inhibitor, Industrial application of catalyst.</p>	<p>Simulation, Demonstration, On-site Visit, Chalk and Board, etc.</p>

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 Use Vernier caliper to : Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. LLO 1.2 Estimate the errors in measurement.	1	Measurements of dimensions of given object by Vernier caliper.	2	CO1
LLO 2.1 Use Micrometer Screw gauge to: Measure dimensions of given objects. Measure the dimensions of objects of known dimensions. LLO 2.2 Estimate the errors in measurement.	2	Measurements of dimensions of given objects by micrometer screw gauge.	2	CO1
LLO 3.1 Apply Ohm's law to solve circuit problems.	3	Determination of resistance by Ohm's law.	2	CO2
LLO 4.1 Determine the specific resistance of given wire.	4	Determination of specific resistance of given wire.	2	CO2
LLO 5.1 Verify law of series connection of resistors.	5	Determination of equivalent resistance in series connection of resistors.	2	CO2
LLO 6.1 Verify law of parallel connection of resistors.	6	Determination of equivalent resistance in parallel connection of resistors.	2	CO2

BASIC SCIENCE**Course Code : 311305**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Use magnetic compass to draw the magnetic lines of forces of magnet of different shapes and determine neutral points.	7	Determination of neutral points by magnetic compass.	2	CO2
LLO 8.1 Use P -N junction diode to draw forward bias and reverse bias I-V characteristics LLO 8.2 Find out static and dynamic resistance of given P N junction diode	8	Determination of static and dynamic resistance of given P N junction diode.	2	CO2
LLO 9.1 Determine forbidden energy band gap in semiconductors	9	Determination of forbidden energy band gap in semiconductors.	2	CO2
LLO 10.1 Use Joule's calorimeter to determine Joule's mechanical equivalent of heat	10	Determination of Joule's mechanical equivalent of heat by Joule's law.	2	CO3
LLO 11.1 Determine the pressure-volume relation using Boyle's law	11	Determination of pressure-volume relation using Boyle's law.	2	CO3
LLO 12.1 Use Newton's law of cooling to determine the rate of heat loss due to convection phenomena	12	Determination of the rate of heat loss due to convection by Newton's law of cooling.	2	CO3
LLO 13.1 Use Searle's thermal conductivity apparatus to find coefficient of thermal conductivity of given material (Virtual Lab)	13	Determination of Coefficient of thermal conductivity.	2	CO3
LLO 14.1 Determine the refractive index of glass slab using TIR phenomenon.	14	Determination of the refractive index of glass slab.	2	CO3
LLO 15.1 Determine the Numerical Aperture (NA) of a given step index optical fibre	15	Determination of the Numerical Aperture (NA) of a given step index optical fiber.	2	CO3
LLO 16.1 Identify cation in given ionic solutions by performing selective test	16	Identification of cation in given ionic solutions.	2	CO4
LLO 17.1 Identify anion in given ionic solutions by performing selective test	17	Identification of anion in given ionic solutions.	2	CO4
LLO 18.1 Identify states of matter of materials by using simulation. by Applying heating and cooling Techniques. LLO 18.2 Relate temperature-pressure diagram	18	Identification of states of matter.	2	CO4
LLO 19.1 Determine the electrode potential of copper metal. by setting Electrochemical Cell LLO 19.2 Measure electrode potential of Cu Using Voltmeter. LLO 19.3 Measure the cell potential for various conditions.	19	Determination of electrode potential of copper.	2	CO5
LLO 20.1 Determine the electrode potential of Iron metal. by setting Electrochemical Cell LLO 20.2 Measure electrode potential of Fe Using Voltmeter LLO 20.3 Measure the cell potential for various conditions.	20	Determination of electrode potential of Iron metal.	2	CO5
LLO 21.1 Determine the voltage generated from chemical reaction using Daniel Cell. LLO 21.2 Set up Daniel Cell. Prepare Electrolyte Solution LLO 21.3 Measure voltage accurately	21	Determination of the voltage generated from chemical reaction using Daniel Cell.	2	CO5

BASIC SCIENCE**Course Code : 311305**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 22.1 Prepare Electrolyte Solution of CuSO ₄ of known concentration LLO 22.2 Set up electrolysis apparatus LLO 22.3 Control various parameters of electrolysis. LLO 22.4 Determine electrochemical equivalent of Cu metal using Faraday's first law.	22	Determination of electrochemical equivalent of Cu metal using Faraday's first law.	2	CO5
LLO 23.1 Prepare Electrolyte Solution of the given metal of known concentration LLO 23.2 Set up electrolysis apparatus LLO 23.3 Control various parameters of electrolysis LLO 23.4 Analyze the data obtained from the experiment. LLO 23.5 Verify Faraday second law	23	Determination of equivalent weight of metal using Faraday's second law.	2	CO5
LLO 24.1 Prepare corrosive solutions LLO 24.2 Determine the extent of corrosion.	24	Preparation of corrosive medium for Aluminium at different temperature.	2	CO5
LLO 25.1 Prepare corrosive solutions. LLO 25.2 Determine the extent of corrosion LLO 25.3 Compare the corrosion behaviour of Aluminum at different temperatures.	25	Determination of rate of corrosion at different temperatures for Aluminium.	2	CO5
LLO 26.1 Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer-	26	Determination of effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I.	2	CO6
LLO 27.1 Determine the steam emulsification number of given lubricating oil. LLO 27.2 Measure the steam flow duration	27	Determination of the steam emulsification number of given lubricating oil.	2	CO6
LLO 28.1 Calculate the flash and fire point of given lubricating oils using Cleveland open cup apparatus	28	Determination of flash and fire point of given lubricating oils using Cleveland open cup apparatus.	2	CO6
LLO 29.1 Determine the flash point of given lubricating oil using Abel's closed cup apparatus.	29	Determination of flash point of given lubricating oil using Abel's closed cup apparatus.	2	CO6
LLO 30.1 Determine thinner content in oil paint. using electric oven	30	Determination of thinner content in oil paint.	2	CO6

Note : Out of above suggestive LLOs -

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

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

- Series and parallel resistances: Prepare models for combination of series and parallel resistances.
- Magnetic flux: Prepare models to demonstrate magnetic lines of forces of different types of magnet.
- Vernier Calipers: Prepare prototype vernier caliper of desired least count using card sheet.
- Conductivity: Collect different materials such as metal, plastics, glass etc. and prepare models.
- Gas laws: Prepare models to demonstrate Boyle's laws, Charles's Law and Gay Lussac's law using household objects.
- Carbon resistors: Determine the resistance and tolerance of carbon resistors using color codes and measure values.

BASIC SCIENCE**Course Code : 311305**

- Thermal conductivity: Take different metallic plates of various metals and calculate rate of flow of heat.
- Temperature sensor : Use Temperature sensor IC LM 35 to measure temperature of given body in various temperature scales
- Mobile applications : Use mobile applications for measurements of different physical quantities.
- Optical Fiber and TIR: Prepare model to demonstrate total internal reflection and the propagation of light.
- Convert given galvanometer into ammeter of desired range.
- Convert given galvanometer into voltmeter of desired range.
- LDR: Use Light dependent resistor for measuring the intensity of light.
- Types of bonds: Prepare chart and models displaying different types of bonds with examples.
- Prepare a chart for showing different types of bonds or molecules.
- Crystal Structure: Prepare Models of SC,FCC,HCP,BCC.
- Ionization: Prepare chart displaying ionization phenomenon.
- Corrosion-Prepare Chart displaying images of observed corrosion processes in the surrounding.
- Adhesives: Prepare chart or model to demonstrate the applications of various adhesives.
- Polymer: Collect the samples of different polymers and list their uses.
- Collect information based on market survey of different Polymer and compare the following points. i) Structure ii) Properties.
- Collect information by library survey regarding engineering material used in various industries.

Assignment

- Convert the units of a given physical quantity from one system of units to another.
- Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different scales.
- Prepare a chart to summarize units and measurements
- Enlist information like band gap, material used, dimension etc about different semiconductor devices.
- Give details about the explanation of concept like electrostatics, magnetic domain, current electricity.
- Demonstrate the variation of angle of refraction with respect to refractive index using online tools.
- Use a digital vernier caliper and micrometer screw gauge for measurements.(lab- based).
- Applications of optical fibers in civil, mechanical , electrical engineering etc.
- Applications of semiconductors in civil, mechanical , electrical engineering etc.
- Explain covalent bond, ionic bond, coordinate bond, hydrogen bond, intermolecular forces
- Draw Crystal structures of SC,BCC, FCC,HCP.
- Distinguish between paints and varnishes.
- Solve numerical based on Faraday's first and second law of electrolysis.
- Enlist various Adhesives with properties and applications.
- Compare between Thermoplastics and Thermosetting.
- State properties and applications thermocol and glass wool.
- Differentiate the given types of structural polymers and list out their applications.
- Demonstrate Mechanism of wet corrosion by waterline corrosion.
- Prepare chart showing mechanism of electrolysis of CuSO₄ solution by using Cu and Pt electrodes.
- Write properties and applications of solid, semisolid and liquid lubricant.

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 judicious 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

BASIC SCIENCE**Course Code : 311305**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier Calipers: Range : 0-150mm , Resolution: 0.1mm	1
2	Joule's calorimeter : well insulated "mechanical equivalent of heat apparatus" in wooden box, , digital / analog thermometer,	10,12
3	Boyle's apparatus: U tube manometer , barometer	11
4	Ammeter 0-2 amp voltmeter-0-5v DC	19,20,21,22,23
5	Electronic balance, with the scale range of 0.001g to 500gm pan size 100 mm; response time 3-5 sec.: power requirement 90-250 V, 10 watt	19,20,21,22,23,24,25,30
6	Micrometer screw gauge : Range : 0-25mm, Resolution: 0.01mm, Accuracy ± 0.02 mm or better	2
7	Redwood viscometer-I	26
8	Cleveland open cup apparatus	28
9	Abel's close cup apparatus	29
10	Digital multimeter : 3 1/2 digit display, 9999 counts, digital multimeter measures: Vac, Vdc (1000V max) , DC A, AC A(10 amp max), Resistance (0 - 100 MOhm	3,4,5,6
11	Resistance Box: 4 decade ranges from 1 ohm to 1K,accuracy 0.1 % - 1 %	3,4,5,6
12	Battery eliminator : 0- 12 V ,2A	3,4,5,6,8,9,10,12
13	Electric oven inner size 18"x18"x18"; temperature range 100 to 2500 C. with the capacity of 40 lt.	30

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	Units and Measurements	CO1	7	2	3	4	9
2	II	Electricity, Magnetism and Semiconductors	CO2	13	3	5	6	14
3	III	Thermometry and Fiber Optics	CO3	10	2	4	6	12
4	IV	Chemical bonding	CO4	6	2	3	4	9
5	V	Electro chemistry and Metal Corrosion, its prevention	CO5	12	3	4	5	12
6	VI	Engineering Materials and Catalysis	CO6	12	3	5	6	14
Grand Total				60	15	24	31	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Two unit tests of 30 marks (Physics 15 marks, Chemistry-15 marks) and average of two unit tests.
- For laboratory learning 50 marks (Physics 25 marks, Chemistry-25 marks).

Summative Assessment (Assessment of Learning)

- End semester assessment of 50 marks for laboratory learning (Physics 25 marks, Chemistry-25 marks).
- End semester assessment of 70 marks through online MCQ examination.

XI. SUGGESTED COS - POS MATRIX FORM

BASIC SCIENCE**Course Code : 311305**

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	3	1		2	1	1	1			
CO2	3	1	1	2	1	1	1			
CO3	3	1	1	2	1	1	1			
CO4	3	2			2		1			
CO5	3	2	1	1	2		1			
CO6	3	2			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	Narlikar J. V. ;Joshi , A. W. ; Mathur , Anuradha ; et al	Physics Textbook Part I - Class XI	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
2	Narlikar, J.V.;Joshi , A. W. ; Mathur , Anuradha ; et al	Physics Textbook Part II - Class XI	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660
3	Narlikar J.V.;Joshi , A. W. ; Ghatak A.K. et al	Physics Textbook Part I - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
4	Narlikar, J.V.;Joshi , A. W. ; Ghatak A.K. et al	Physics Textbook Part II - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
5	Haliday, David; Resnik, Robert and Walker, Jearl	Fundamentals of Physics	John Wiley & sons, Hoboken, USA, 2014 ISBN : 812650823X
6	Jain and Jain	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
7	Dara S. S.	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660
8	Bagotsky V.S.	Fundamental of electrochemistry	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
9	Jain and Jain	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
10	Aryabhata.	The Surya Siddhanta	Baptist Mission press ,Calcutta
11	Steeramula Rajeswara Sarma	The Archaic And The Exotic : Studies In The History Of Indian Astronomical Instruments	Published by Manohar Book Service, 2008 ISBN 10: 8173045712 / ISBN 13: 9788173045714

BASIC SCIENCE**Course Code : 311305**

Sr.No	Author	Title	Publisher with ISBN Number
12	Anju Rawlley, Devdatta V. Saraf	Applied Chemistry with Lab Manual	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8
13	Dr. Hussain Jeevakhan	Applied Physics - II	Khanna Book Publishing, (2021), ISBN: 978-93-91505-57-8

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.sciencejoywagon.com/physicszone	Electricity, Magnetism and Semiconductors , basic of fiber optics
2	https://phet.colorado.edu	Electricity, Magnetism and Semiconductors , Thermometry and basic of fiber optics
3	www.physicsclassroom.com	concepts of basic physics
4	http://nptel.ac.in/course.php?disciplineId=104	concepts of basic physics
5	http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html	concepts of basic physics
6	https://www.youtube.com/results?search_query=amruta+university+physics+expts	concepts of basic physics
7	k. https://www.youtube.com/results?search_query=physics+classes+11+chapter+1	concepts of basic physics
8	l. https://www.youtube.com/watch?v=zRGh9_a1J7s	concepts of basic physics
9	https://iksindia.org	IKS physics
10	www.chem1.com	Chemistry instruction and education
11	www.onlinelibrary.wiley.com	Materials and corrosion
12	www.rsc.org	Catalysis
13	www.chemcollective.org	Virtual Labs, simulation
14	https://www.ancient-origins.net/history-famous-people/indian-sage-acharya-kanad-001399	IKS Philosophy of atom by Acharya Kanad.
15	https://phet.colorado.edu/en/simulations/filter?subjects=chemistry&type=html,prototype	Identify states of matter of materials by using simulation.

Note :

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

PROFESSIONAL COMMUNICATION**Course Code : 312002**

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	: Second
Course Title	: PROFESSIONAL COMMUNICATION
Course Code	: 312002

I. RATIONALE

Communication is key to smooth and efficient functioning of any industry or business . Professional communication is the need of every organization to maintain ethics, quality and standards. The efficacy of business communication skills are essential for engineering professionals to instruct, guide and motivate peers/ subordinates to achieve desired goals at work place. Strong Communication skills are highly valued in the professional world and contribute to career growth and opportunities. Thus, this course has been designed to enhance the professional communication skills for effective presentation both in written and oral forms at workplace.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

1. Communicate effectively at workplace. 2. Issues can be identified and resolved by brainstorming solutions 3. Effective communication ensures strong decision making

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Communicate effectively (oral / spoken and Written) in various formal and informal situations minimizing the barriers.
- CO2 - Develop listening skills through active listening and note taking.
- CO3 - Write circulars, notices and minutes of the meeting.
- CO4 - Draft inquiry letter, complaint letter , Job application with resume / CV, Compose effective E - mails .
- CO5 - Write Industrial reports.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

PROFESSIONAL COMMUNICATION**Course Code : 312002**

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	
				CL	TL	LL					FA-TH	SA-TH	Total	Practical		SLA					
							FA-PR	SA-PR						Max	Min	Max	Min				
312002	PROFESSIONAL COMMUNICATION	PCO	SEC	-	-	2	-	2	1	-	-	-	-	-	25	10	25@	10	-	-	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

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 importance of professional communication in given situations TLO 1.2 Identify the types of communication barriers in given situations and suggestive remedies TLO 1.3 Use different types of verbal and non-verbal communication for the given situation	Unit - I Professional Communication : An Overview 1.1 Definition of professional communication- Importance, relevance, Elements and process of communication 1.2 7 C's of Professional Communication (Clarity, Conciseness, correctness, Coherent, concrete, courteous and Complete) 1.3 Types –Verbal (Oral-Written),Formal, Informal (Grapevine), Vertical 1.4 Barriers to communication,Types of barriers (Linguistic, Psychological, Technological)	Language lab Role plays Chalk board Reference books Case studies
2	TLO 2.1 Identify the difference between listening and hearing TLO 2.2 Differentiate the types of listening in various situations TLO 2.3 Take notes during lectures, seminars . Make use of types of note taking and note making for different subjects / topics	Unit - II Listening & Note Taking 2.1 Difference between listening & Hearing 2.2 Types of listening a)Active listening b)Passive listening c)Selective listening 2.3 Techniques of Note taking , Types of note taking (Outline notes, Mind Mapping, Flowcharts)	Language Lab Classroom learning NPTEL Role Play
3	TLO 3.1 Prepare notices / agenda for the given type of meeting / information TLO 3.2 Prepare minutes of meeting/s TLO 3.3 Draft a circular for a particular information/ event	Unit - III Office Drafting 3.1 Format of Notice and Circular 3.2 Drafting Agenda 3.3 Preparing Minutes of meeting	white board Language Lab Reference books Classroom learning

PROFESSIONAL COMMUNICATION**Course Code : 312002**

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 Compose cover letter and CV / Resume for jobs TLO 4.2 Apply E- mail Etiquette for professional purposes TLO 4.3 Compose E- mails for different official purposes	Unit - IV Writing Skills for Professional Communication 4.1 Job Application with Resume / CV 4.2 E-Mail Etiquettes 4.3 Writing official E- Mails to communicate intended purposes 4.4 Drafting Enquiry letter and Complaint letter	Language lab Classroom learning NPTEL Reference books
5	TLO 5.1 Compose technical reports TLO 5.2 Draft accident / Investigation/ Daily reports	Unit - V Report Writing 5.1 Introduction to report writing 5.2 Accident Report 5.3 Investigation Report 5.4 Daily Report	Chalk and talk Language Lab Collaborative learning Classroom 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 Draw communication cycle using real life examples and explain process of communication.	1	*Communication Process and Cycle	2	CO1
LLO 2.1 Undertake the Role play / Group discussion to illustrate types / barriers to communication	2	Role plays and Group Discussion	2	CO1
LLO 3.1 Listen to audios in the language lab and make notes of it.	3	*Active Listening	2	CO2
LLO 4.1 Give a presentation / Seminar using 7 C's of Communication.	4	*Presentations / Seminars	2	CO1
LLO 5.1 Explain the types of note taking with examples and make notes on any one topic related to your curriculum.	5	*Note taking and Note Making	2	CO2
LLO 6.1 Prepare agenda for meeting and draft minutes of the meeting.	6	*Agenda and Minutes of the meeting	2	CO3
LLO 7.1 Draft circulars for the given situation .	7	*Office Drafting	2	CO3
LLO 8.1 Respond to job advertisements referring newspapers, LinkedIn. Write cover letter with resume /CV.	8	*Type Job Application with Resume / CV	2	CO4
LLO 9.1 Type Four (formal) E-mails using ethics and etiquette.	9	* E- Mail writing	2	CO4
LLO 10.1 Write a detailed report on Accident/ Investigation .	10	*Technical Report writing	2	CO5
LLO 11.1 Prepare a case study related to linguistic barriers : language ,pronunciation, punctuation, technical jargon and suggest remedies for the same.	11	*Barriers to Communication	2	CO1
LLO 12.1 Draft complaint / enquiry letter for various situations	12	Complaint and Enquiry letter	2	CO4
LLO 13.1 List psychological barriers to communication LLO 13.2 Prepare case studies on any two psychological barriers and suggest remedies to overcome the barriers	13	Psychological barriers to Communication	2	CO1

PROFESSIONAL COMMUNICATION**Course Code : 312002**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 14.1 Draw flow chart and mind mapping for any topic related to the curriculum.	14	*Listening Skills	2	CO2
LLO 15.1 Face mock interview arranged by your teacher.	15	* Typed Job Application , Resume / CV/ formal dressing and Interview	2	CO4

Note : Out of above suggestive LLOs -

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

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

- Conduct an interview of any person and follow the procedure (interview questions, photo with the interviewee etc.)
- Listening and Speaking are life long learnings . Explain with appropriate examples and real life case studies.
- Collect (four to five) emails with technical jargons, barriers, make required corrections and keep a record of both the mails (original and Corrected one)
- Complete any one certification course of (Two Weeks duration) from (MOOC/ NPTEL/ Coursera/ any other source)related to Communication Skills / Personality Development.
- Prepare a report on aspects of body language
- Prepare a case study on Technological /Psychological barriers to communication

Reading for vocabulary and sentence structure

- Read any motivational book and present a review of the book

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	Smart Board with networking	All
2	Language Lab with software and internet facility	All
3	LCD Projector	All
4	Printer	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE**X. ASSESSMENT METHODOLOGIES/TOOLS**

PROFESSIONAL COMMUNICATION**Course Code : 312002****Formative assessment (Assessment for Learning)**

- Term Work, Micro Project

Summative Assessment (Assessment of Learning)

- Practical Exam of 25 marks using language lab

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	1	1		1	3	1			
CO2	1	1				3	1			
CO3	1					3	1			
CO4		1				3	1			
CO5		1	1			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	M Ashraf Rizvi	Effective Communication Skills	Tata McGraw-Hill Publication-ISBN 0070599521, 9780070599529
2	Sanjay Kumar and Pushp Lata	Communication Skills	Oxford University Press ISBN 9780199457069
3	MSBTE Textbook	Communication Skills	MSBTE
4	Robert King	Effective communication Skills	Audio Book -ISBN 978181667009742
5	N P Sudharshana , C Savitha	English for Technical Communication	Cambridge-ISBN 978-13-16640-08-1
6	C. Murlikrishna , Sunita Mishra	Communication Skills for Engineers	Pearson - ISBN 978-81-317-3384-4
7	Meenakshi Raman, Sangeeta Sharma	Technical Communication, Principles and Practice	Oxford University Press -ISBN 978-13-16640-08-1
8	K. K. Sinha	Business Communication	Galgotiya Publishing company, New Delhi - ISBN 9789356227064
9	Rajendra Pal, J.S. Korlahalli	Essentials of Business Communication	Sultan Chand & Sons, New Delhi ISBN 9788180547294

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.britishcouncil.in	conversations
2	https://www.coursera.org	certification courses
3	https://www.udemy.com	Communication skills training courses
4	http://www.makeuseof.com	Dale Carnegie's free resources

PROFESSIONAL COMMUNICATION**Course Code : 312002**

Sr.No	Link / Portal	Description
Note : <ul style="list-style-type: none">Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

MSBTE Approval Dt. 01/10/2024**Semester - 2, K Scheme**

SOCIAL AND LIFE SKILLS**Course Code : 312003**

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/ 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/ MU/ PG/ PN/ PO/ SC/ SE/ TC/ TE/ TR/ TX
Semester	: Second
Course Title	: SOCIAL AND LIFE SKILLS
Course Code	: 312003

I. RATIONALE

Rationale : Life skills can be defined as abilities that enable humans to deal effectively with the demands and challenges of life. Social skills are a subset of life skills that are needed for successful, healthy relationships to easily adapt when moving from one social situation to the next. They help regulate our emotions effectively and develop enduring, supportive relationships, we're happier and healthier. This is why developing life skills and eventually social skills is key not only to being successful in life, it's key for our health and well-being. Thus, Teaching of Social and life skills provide students with essentials of knowing , understanding attitudes, values, morals ,social skills and better equip them to handle stress and build their self efficacy, self esteem and self confidence.

Note : The course offers five different alternatives(modules) for achieving above outcomes . Students must complete any one module from the following given options.

- a. MODULE-I : Unnat Maharashtra Abhiyan (UMA)
- b. MODULE-II : National Service Scheme (NSS)
- c. MODULE-III : Unniversal Human Values
- d. MODULE-IV: Value Education (Unnati Foundation)
- e. MODULE-V : Financial Literacy (NABARD)

The institute can choose to offer any one MODULE to the groups of the students by taking into consideration the resources required and resources available in the institute . Different group of students maybe offered different MODULE based on their choices .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME**MSBTE Approval Dt. 01/10/2024****Semester - 2, K Scheme**

SOCIAL AND LIFE SKILLS**Course Code : 312003**

Demonstrate critical social and life skills ethics, resilience, positive attitude , integrity and self-confidence at workplace and society at large.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Enhance the ability to be fully self-aware and take challenges by overcoming all fears and insecurities and grow fully.
- CO2 - Increase self-knowledge and awareness of emotional skills and emotional intelligence at the place of study/work.
- CO3 - Provide the opportunity to realizing self-potential through practical experience while working individually or in group.
- CO4 - Develop interpersonal skills and adopt good leadership behaviour for self-empowerment and empowerment of others.
- CO5 - Set appropriate life goals with managing stress and time effectively.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory	Based on LL & TL		Based on SL		Total					
				CL	TL	LL						Practical									
							FA-TH	SA-TH				Total		FA-PR			SA-PR		SLA		
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min										
312003	SOCIAL AND LIFE SKILLS	SFS	VEC	-	-	-	2	2	1	-	-	-	-	-	-	-	-	-	50	20	50

Total IKS Hrs for Sem. : 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.
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SOCIAL AND LIFE SKILLS

Course Code : 312003

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	<p>TLO 1.1 Explain developmental needs and connection of various stakeholders</p> <p>TLO 1.2 Enlist the local problems</p> <p>TLO 1.3 Design a methodology for fieldwork</p> <p>TLO 1.4 Select the attributes of engineering and social system for measurement, quantification, and documentation</p> <p>TLO 1.5 Measure & quantify the quantities / systems parameters</p> <p>TLO 1.6 Write a report using information collected tStudy the data collected from fieldwork and conclude the observations</p>	<p>MODULE I : Activities Under Unnat Maharashtra Abhiyan (UMA)</p> <p>1.1 Introduction to Societal Needs and respective stakeholders : Regional societal issues that need engineering intervention</p> <p>1.2 Multidisciplinary approach-linkages of academia, society and technology</p> <p>1.3 Stakeholders' involvement</p> <p>1.4 Introduction to Important secondary data sets available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc</p> <p>1.5 Problem Outline and stakeholders : Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal)</p> <p>1.6 Key attributes of measurement</p> <p>1.7 Various instruments used for data collection - survey templates, simple measuring equipments</p> <p>1.8 Format for measurement of identified attributes/ survey form and piloting of the same</p> <p>1.9 Fieldwork : Measurement and quantifications of local systems such as agriculture produce, rainfall, Road network, production in local industries, Produce /service which moves from A to B</p> <p>1.10 Analysis and Report writing Report writing containing-</p> <ol style="list-style-type: none"> 1. Introduction of the topic 2. Data collected in various formats such as table, pie chart, bar graph etc 3. Observations of field visits and data collected. 	<p>i) Group discussion</p> <p>ii) Role play</p> <p>iii) Case study</p> <p>iv) Seminar and presentation</p> <p><u>Implementation guidelines suggested</u></p> <p>The course will be implemented in eight sessions and fieldwork:</p> <ol style="list-style-type: none"> a) Session I - Introduction to development paradigm, fieldwork and case study as pedagogy b) Session II - VII - Society, stakeholders and value creation, measurements, rudimentary analysis and reporting c) Session VIII - Final closure session feedback and assessment d) Field work - <ol style="list-style-type: none"> 1. Pilot Visit - Pilot of survey instrument 2. Survey Visit 1 - Data gathering / Information Collection 3. Survey Visit 2 - Data gathering 4. Summary Visit - Closure after analysis <p>Methodology: Considering the nature of the course designed, following points shall be considered while implementing the course.</p> <ol style="list-style-type: none"> i) Regroup in the batches of 5-6 students for conducting the fieldwork from the bigger group. ii) Assign a few batches of the students for this course to all the faculty members. iii) A group of course teachers will visit local governance bodies such as Municipal Corporations, Village Panchayats, Zilla Parishads, Panchayat Samitis to assess the small technological / engineering needs in their area of work.

SOCIAL AND LIFE SKILLS**Course Code : 312003**

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.
			iv) The group of course teachers will carry out initial field visits to evaluate the various possibilities of field visits / various scenarios where in students can conduct field work to measure / quantify the parameters / attributes.
2	<p>TLO 2.1 Adopt a Village or Slum for providing needed services to the community</p> <p>TLO 2.2 Carry out Survey to identify the problems of village community</p> <p>TLO 2.3 Undertake Special camping about developmental programs</p> <p>TLO 2.4 Establish the liaisons between government and other developmental agencies for the implementations of various development schemes of Government</p>	<p>MODULE II : National Service Scheme (NSS)</p> <p>2.1 Contacting Village/Area Leaders</p> <p>2.2 Primary socio economic survey of few villages in the vicinity of the institute.</p> <p>2.3 Selection of the village for adoption - conduct of activities</p> <p>2.4 Comprehensive Socio Economic Survey of the Village/Area</p> <p>2.5 Identification of Problem(s)</p> <p>2.6 Dissemination of information about the latest developments in agriculture, watershed management, wastelands development, non-conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, government schemes, legal aid, consumer protection and allied fields.</p> <p>2.7 A liaison between government and other development agencies for the implementation of various development schemes in the selected village / slum.</p>	<p>(i) The teachers should visit the village / slum before adopting it for NSS activities.</p> <p>(ii) The selected area should be compact.</p> <p>(iii) The community people should be receptive to the ideas of improving their living standard. They should also be ready to coordinate and involve in the projects undertaken by the NSS for their upliftment.</p> <p>(iv) The areas where political conflicts are likely to arise should be avoided by the NSS units.</p> <p>(v) The area should be easily accessible to the NSS volunteers to undertake frequent visits to slums.</p>
3	<p>TLO 3.1 Demonstrate Love and Compassion (Prem and Karuna) in the society</p> <p>TLO 3.2 Follow the path of Truth (Satya)</p> <p>TLO 3.3 Practice Non-Violence (Ahimsa)</p> <p>TLO 3.4 Follow the Righteousness (Dharma)</p> <p>TLO 3.5 Attain Peace (Shanti) in Life</p> <p>TLO 3.6 Provide Service (Seva) to the needy person/community.</p> <p>TLO 3.7 Demonstrate Renunciation (Sacrifice) Tyaga</p> <p>TLO 3.8 Practice Gender Equality and Sensitivity</p>	<p>MODULE-III : Universal Human Values</p> <p>3.1 Love and Compassion (Prem and Karuna): Introduction, Practicing Love and Compassion (Prem and Karuna)</p> <p>3.2 Truth (Satya) : Introduction, Practicing Truth (Satya)</p> <p>3.3 Non-Violence (Ahimsa) : Introduction, Practicing Non-Violence (Ahimsa)</p> <p>3.4 Righteousness (Dharma) : Introduction, Practicing Righteousness (Dharma)</p> <p>3.5 Peace (Shanti) : Introduction, Practicing Peace (Shanti)</p> <p>3.6 Service (Seva) : Introduction, Practicing Service (Seva)</p> <p>3.7 Renunciation (Sacrifice) Tyaga : Introduction, Practicing Renunciation (Sacrifice) Tyaga</p> <p>3.8 Gender Equality and Sensitivity: Introduction, Practicing Gender Equality and Sensitivity</p>	<p>i) Lectures</p> <p>ii) Demonstration</p> <p>iii) Case Study</p> <p>iv) Role Play</p> <p>v) Observations</p> <p>vi) Portfolio Writing</p> <p>vii) Simulation</p> <p>viii) Motivational talks by Practitioners</p> <p>ix) Site/Industry Visit</p>

SOCIAL AND LIFE SKILLS**Course Code : 312003**

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	<p>TLO 4.1 Demonstrate Punctuality appropriately</p> <p>TLO 4.2 Practice Cleanliness, Hygiene and Orderliness for self and others</p> <p>TLO 4.3 Take Responsibility and Calculated Risks</p> <p>TLO 4.4 Demonstrate Gratitude and Appreciations</p> <p>TLO 4.5 Show Determination & Persistence about work</p> <p>TLO 4.6 Give Respect as per the social norms and practice</p> <p>TLO 4.7 Respect Team Spirit to the acceptable level</p> <p>TLO 4.8 Practice Caring & Sharing among fellow citizens/community</p> <p>TLO 4.9 Demonstrate Honesty</p> <p>TLO 4.10 Practice for Forgive and Forget</p>	<p>MODULE-IV: Value Education (Unnati Foundation)</p> <p>4.1 Punctuality, Icebreaker and Simple Greeting, Understanding & Managing Emotions, Introducing Self, The power of a Positive Attitude, Talking about one's Family, Talking about one's Family, Making a Positive Impression, Give word list for a Word based</p> <p>4.2 Cleanliness , Hygiene and Orderliness , Likes and Dislikes, Developing Confidence in Self and Others, Strengths and Weaknesses, Listening Skills , Greeting gestures, Gender Equality and Sensitivity</p> <p>4.3 Responsibility, OCSEM- Visual Comprehension and Word Based Learning, Goal Setting – Make it happen, Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter Introducing Others, Time Management, Talking about the daily routine, Money Management</p> <p>4.4 Gratitude and Appreciation , Asking Simple Questions & Asking for the price , Stress Management, Student Referral process ,Comprehending & Paraphrasing Information, A Plate of Rice and Dignity of Labour, Topics for Public Speaking, Placement Process , OCSEM-E-Newspaper, Critical Thinking to overcome challenges</p> <p>4.5 Determination and Persistence, Guiding and Giving Directions, Language Etiquette & Mannerism, . Unnati Philosophy , b. Unnati Branding - Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter, Simple instructions to follow procedures, Assertiveness, Give topics for Debate, Describing a person/Objects, Refusal Skills, Word List for Word based Learning</p> <p>4.6 Respect, Comparing , OCSEM - Public Speaking, Student referral process, Attending a phone call, Being a Good Team Player , Placement Process, At a Restaurant, Workplace ethics</p> <p>4.7 Team Spirit, Inviting someone, OCSEM - Picture Reading & Word, a. Unnati Philosophy & b. Unnati Branding - Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter, Apologizing, Apologizing, Dealing effectively with Criticism, Introduce Importance of Self Learning and upskilling</p>	<p>i) Video Demonstrations</p> <p>ii) Flipped Classroom</p> <p>iii) Case Study</p> <p>iv) Role Play</p> <p>v) Collaborative learning</p> <p>vi) Cooperative Learning</p> <p>vii) Chalk-Board</p>

SOCIAL AND LIFE SKILLS**Course Code : 312003**

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.
		4.8 Caring and Sharing , Handling Customer queries, Flexibility & Adaptability, Student referral process, Writing a Resume, OCSEM-Public Speaking, Placement Process, Meditation/ Affirmation & OCSEM-Debate, Introduce Certif-ID, how to create Certif-ID Project , 4.9 Honesty, Email etiquette & Official Email communication, Alcohol & Substance use & abuse, Describing a known place , Leadership Skills, Describing an event, OSCEM-Picture Reading & Visual Comprehension 4.10 Forgive and Forget, Facing and Interview, OSCEM-Public Speaking , Attending a telephonic/Video interview & Mock Interview , Affirmation , Pat-a-Back & Closure (Valediction , Unnati Branding, Student Testimonials), Meditation/ Affirmation & Sponsor connect (Speak to UNXT HO)	
5	TLO 5.1 Develop Literacy About Savings and Investments in the community TLO 5.2 Attain Literacy About Financial Planning TLO 5.3 Demonstrate skills about Financial Transactions TLO 5.4 Use Literacy skills About Income, expenditure and budgeting TLO 5.5 Use measures about Inflation in the market. TLO 5.6 Use Literacy/Knowledge About Loans TLO 5.7 Explain the Importance of Insurance TLO 5.8 Follow Dos and Donts about finances	MODULE-V : Financial Literacy 5.1 Introduction - Life Goals and financial goals 5.2 Savings and Investments - Three pillars of investments, Popular asset classes, Government schemes, Mutual Funds, Securities markets (Shares and bonds), Gold, Real Estate, Do's and Don'ts of investments 5.3 Retirement planning 5.4 Cashless transactions 5.5 Income, expenditure and budgeting – Concepts and Importance 5.6 Inflation- Concept, effect on financial planning of an individual 5.7 Loans – Types, Management of loans, Tax benefits 5.8 Insurance – Types, Advantages, selection 5.9 Dos and Donts in Financial planning and Transactions	i) Online/Offline Mode of Instructions ii) Video Demonstrations iii) Presentations iv) Case Study v) Chalk-Board vi) Collaborative 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)

Suggestive list of activities during Regular as well as Special Camping (NSS Activities)

- Following list is only an illustrative list of the type of activities that can be undertaken. Under the programme it would be open to each NSS Unit to undertake one of these programmes or any other activity which may seem desirable to them according to local needs. The NSS Unit should aim at the integrated development of the area selected for its operation which could be a village or a slum. It has also to be ensured that at least a part of the

SOCIAL AND LIFE SKILLS**Course Code : 312003**

programme does involve manual work.

(a) Environment Enrichment and Conservation:

The activities under this sub-theme would inter-alia, include:

- (i) plantation of trees, their preservation and upkeep
- (ii) Construction & maintenance of village streets, drains
- (iii) Cleaning of village ponds and wells;
- (iv) Popularization and construction of Gobar Gas Plants, use of non-conventional energy;
- (v) Disposal of garbage & composting;
- (vi) Prevention of soil erosion and work for soil conservation,
- (vii) Watershed management and wasteland development
- (viii) Preservation and upkeep of monuments, and creation of consciousness about the preservation of cultural heritage among the community.

(b) Health, Family Welfare and Nutrition Programme:

- (i) Programme of mass immunization;
- (ii) Working with people in nutrition programmes with the help of Home Science and medical college students;
- (iii) Provision of safe and clean drinking water;
- (iv) Integrated child development programmes;
- (v) Health education, AIDS Awareness and preliminary health care.
- (vi) Population education and family welfare programme;
- (vii) Lifestyle education centres and counselling centres.

© Programmes aimed at creating an awareness for improvement of the status of women: (i) programmes of educating people and making them aware of women's rights both constitutional and legal;

(ii) creating consciousness among women that they too contributed to economic and social well-being of the community;

(iii) creating awareness among women that there is no occupation or vocation which is not open to them provided they acquire the requisite skills; and

(iv) imparting training to women in sewing, embroidery, knitting and other skills wherever possible.

(d) Social Service Programmes:

(i) work in hospitals, for example, serving as ward visitors to cheer the patients, help the patients, arranging occupational or hobby activities for long term patients; guidance service for out-door-patients including guiding visitors about hospital's procedures, letter writing and reading for the patients admitted in the hospital; follow up of patients discharged from the hospital by making home visits and places of work, assistance in running dispensaries etc.

(ii) work with the organisations of child welfare;

(iii) work in institutions meant for physically and mentally handicapped;

(iv) organising blood donation, eye pledge programmes;

(v) work in Cheshire homes, orphanages, homes for the aged etc.;

(vi) work in welfare organisations of women;

(vii) prevention of slums through social education and community action;

(e) Production Oriented Programmes:

(i) working with people and explaining and teaching improved agricultural practices;

(ii) rodent control and pest control practices;

(iii) weed control;

(iv) soil-testing, soil health care and soil conservation;

(v) assistance in repair of agriculture machinery;

(vi) work for the promotion and strengthening of cooperative societies in villages;

(vii) assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;

(viii) popularisation of small savings and assistance in procuring bank loans

(f) Relief & Rehabilitation work during Natural Calamities:

SOCIAL AND LIFE SKILLS**Course Code : 312003**

- (i) assisting the authorities in distribution of rations, medicine, clothes etc.;
- (ii) assisting the health authorities in inoculation and immunisation, supply of medicine etc.;
- (iii) working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
- (iv) assisting and working with local authorities in relief and rescue operation;
- (v) collection of clothes and other materials, and sending the same to the affected areas;

(g) Education and Receptions: Activities in this field could include:

- (i) adult education (short-duration programmes);
- (ii) pre-school education programmes;
- (iii) programmes of continuing education of school drop outs, remedial coaching of students from weaker sections;
- (iv) work in crèches;
- (v) participatory cultural and recreation programmes for the community including the use of mass media for instruction and recreation, programmes of community singing, dancing etc.;
- (vi) organisation of youth clubs, rural land indigenous sports in collaboration with Nehru Yuva Kendras;
- (vii) programmes including discussions on eradications of social evils like communalism, castism, regionalism, untouchability, drug abuse etc.;
- (viii) non- formal education for rural youth and
- (ix) legal literacy, consumer awareness.

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 judicious 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 may be considered for FA-PR evaluations.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Simple engineering measurement devices GPS data collection tools GIS open source softwares- Google Earth and QGIS MS office suite	All

IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE**X. ASSESSMENT METHODOLOGIES/TOOLS****Formative assessment (Assessment for Learning)**

- Formative assessment (Assessment for Learning) Report and presentation of fieldwork activities, Self-Learning (Assignment)

Summative Assessment (Assessment of Learning)**XI. SUGGESTED COS - POS MATRIX FORM**

SOCIAL AND LIFE SKILLS**Course Code : 312003**

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					03	03	03			
CO2					02	02	03			
CO3	01	01	01		03	03	03			
CO4		01	01	01	03	03	03			
CO5		02		01	03	03	03			

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	IRAP, Hyderabad, CTARA, IIT Bombay and UNICEF, Mumbai	Compendium of Training Materials for the Capacity Building of the Faculty and Students of Engineering Colleges on 'IMPROVING THE PERFORMANCE OF RURAL WATER SUPPLY AND SANITATION SECTOR IN MAHARASHTRA' Districts Economic survey reports	UNICEF
2	Central Public Health and Environmental Engineering Organisation	Manual on Water Supply and Treatment	Ministry of Urban Development, New Delhi
3	Specifications And Standards Committee	Indian Standards (IS) Codes and Indian Roads Congress (IRC) Codes	Bureau of Indian Standards and The Indian Road Congress
4	Prepared by each district administration	Districts Economic survey reports	Govt. of Maharashtra
5	Local college students, UMA staffs	Sample Case Studies on UMA website	IITB-UMA team
6	RBI	https://www.rbi.org.in/FinancialEducation/content/GUIDE310113_F.pdf	RBI
7	RBI	https://www.rbi.org.in/FinancialEducation/content/Financing%20needs%20of%20Micro%20and%20small%20Enterprises%20-%20A%20guide.pdf	RBI
8	RBI	https://www.rbi.org.in/FinancialEducation/content/I%20Can%20Do_RBI.pdf	RBI

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
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SOCIAL AND LIFE SKILLS**Course Code : 312003**

Sr.No	Link / Portal	Description
1	https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201601131501523808.pdf	Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan
2	https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/English/201606151454073708.pdf	Government Resolution of Government of Maharashtra regarding Unnat Maharashtra Abhiyan Guidelines
3	https://censusindia.gov.in/census.website/	A Website of Census of India
4	https://gsda.maharashtra.gov.in/english/	A Website of Groundwater Survey and Development Agency, GoM
5	https://mrsac.gov.in/MRSAC/map/map	A Website where district-wise maps showcasing different attributes developed by Maharashtra Remote Sensing Applications Centre.
6	https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx	A Website of Jal Jivan Mission, Government of India
7	https://cpcb.nic.in/	A Website of Central Pollution Control Board, Government of India
8	http://www.mahapwd.com/#	A Website of Public Works Department, GoM
9	http://tutorial.communitygis.net/	A Website for GIS data sets developed by Unnat Maharashtra Abhiyan
10	https://youtu.be/G71maumVZ1A?si=TzDTxKUPLYaRos7U	A video record of lecture by Prof. Milind Sohoni, IIT Bombay, on Engineering, Development and Society
11	https://youtu.be/TUcPNwtdKyE?si=wnSWrhGc9dJTC-ac	A keynote talk by Prof. Milind Sohoni, IIT Bombay, on Interdisciplinary Engineering: The Road Ahead
12	https://youtu.be/mKJj6j_1gWg?si=ajE8s4lfB2OM63Ng	A TED talk by Prof. Milind Sohoni, IIT Bombay, on Vernacular Science: The Science of Delivery
13	https://www.ugc.gov.in/pdfnews/4371304_LifeSKill_JeevanKaushal_2023.pdf	UHV: UGC Course on life skills. Unit 4 i.e. Course 4 is to be referred
14	https://nss.gov.in/	NSS : Know about the NSS Scheme and details
15	https://www.rbi.org.in/FinancialEducation/FinancialEntrepreneur.aspx	Reference for Module V
16	https://www.rbi.org.in/FinancialEducation/content/I%20Can%20Do_RBI.pdf	Reference for Module V
17	https://www.rbi.org.in/FinancialEducation/content/Financing%20needs%20of%20Micro%20and%20small%20Enterprises%20-%20A%20guide.pdf	Reference for Module V
18	https://www.rbi.org.in/FinancialEducation/content/GUIDE310113_F.pdf	Reference for Module V

SOCIAL AND LIFE SKILLS**Course Code : 312003**

Sr.No	Link / Portal	Description
Note :		
<ul style="list-style-type: none">Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

MSBTE Approval Dt. 01/10/2024**Semester - 2, K Scheme**

APPLIED MATHEMATICS**Course Code : 312301**

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/ Digital Electronics/ Data Sciences/ Electrical Engineering/ Electronics & Tele-communication Engg./ Electrical and Electronics Engineering/ Electrical Power System/ Electronics & Communication Engg./ Electronics Engineering/ 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 Electronics/ Production Engineering/ Computer Science/ Electronics & Computer Engg.
Programme Code	: AA/ AE/ AI/ AL/ AN/ AO/ AT/ BD/ CE/ CH/ CM/ CO/ CR/ CS/ CW/ DE/ DS/ EE/ EJ/ EK/ EP/ ET/ EX/ HA/ IC/ IE/ IF/ IH/ IS/ IX/ IZ/ LE/ ME/ MK/ MU/ PG/ SE/ TE
Semester	: Second
Course Title	: APPLIED MATHEMATICS
Course Code	: 312301

I. RATIONALE

An Applied Mathematics course, covering integration, definite integration, differential equations, numerical methods, and probability distribution, equips engineering students with essential problem-solving tools. It enables them to model and analyze complex systems, make informed decisions and address real-world engineering challenges effectively.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Engineers applying Mathematics should proficiently solve complex real-world problems, enhancing decision-making, design and innovation with precision and efficiency.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Solve the broad-based engineering problems of integration using suitable methods.
- CO2 - Use definite integration to solve given engineering related problems.
- CO3 - Apply the concept of differential equation to find the solutions of given engineering problems.
- CO4 - Employ numerical methods to solve programme specific problems.
- CO5 - Use probability distributions to solve elementary engineering problems.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Paper Duration	Assessment Scheme									
				Actual Contact Hrs./Week			SL	LH	NLH			Theory			Based on LL & TL				Based on SL		Total Marks
				CL	TL	LL						FA-TH	SA-TH	Total	Practical		SLA				
															FA-PR	SA-PR	Max	Min	Max	Min	
312301	APPLIED MATHEMATICS	AMS	AEC	3	1	-	-	4	2	3	30	70	100	40	-	-	-	-	-	-	100

APPLIED MATHEMATICS**Course Code : 312301****Total IKS Hrs for Sem. : 2 Hrs**

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Solve the given simple problem(s) based on rules of integration. TLO 1.2 Evaluate the given simple integral(s) using substitution method. TLO 1.3 Integrate given simple functions using the integration by parts. TLO 1.4 Solve the given simple integral by partial fractions.	Unit - I Indefinite Integration 1.1 Simple Integration: Rules of integration and integration of standard functions 1.2 Integration by substitution. 1.3 Integration by parts. 1.4 Integration by partial fractions (only linear non repeated factors at denominator of proper fraction).	Improved Lecture Demonstration Chalk-Board Presentations Video Demonstrations
2	TLO 2.1 Solve given examples based on Definite Integration. TLO 2.2 Use properties of definite integration to solve given problems.	Unit - II Definite Integration 2.1 Definite Integration: Definition, rules of definite integration with simple examples. 2.2 Properties of definite integral (without proof) and simple examples.	Video Simulation Chalk-Board Improved Lecture Presentations
3	TLO 3.1 Find the order and degree of given differential equations. TLO 3.2 Form simple differential equation for given elementary engineering problems. TLO 3.3 Solve given differential equations using the methods of Variable separable and Exact Differential Equation(Introduce the concept of partial differential equation). TLO 3.4 Solve given Linear Differential Equation.	Unit - III Differential Equation 3.1 Concept of Differential Equation. 3.2 Order, degree and formation of Differential equations 3.3 Methods of solving differential equations: Variable separable form, Exact Differential Equation, Linear Differential Equation.	Video Demonstrations Presentations Chalk-Board Improved Lecture Flipped Classroom

APPLIED MATHEMATICS**Course Code : 312301**

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 Find roots of algebraic equations by using appropriate methods. TLO 4.2 Solve the system of equations in three unknowns by iterative methods. TLO 4.3 Solve problems using Bakhshali iterative method for finding approximate square root. (IKS)	Unit - IV Numerical Methods 4.1 Solution of algebraic equations: Bisection method, Regula falsi method and Newton –Raphson method. 4.2 Solution of simultaneous equations containing three Unknowns by iterative methods: Gauss Seidal and Jacobi's method. 4.3 Bakhshali iterative method for finding approximate square root. (IKS)	Video SCILAB Spreadsheet Chalk-Board Flipped Classroom Presentations
5	TLO 5.1 Solve given problems based on repeated trials using Binomial distribution. TLO 5.2 Solve given problems when number of trials are large and probability is very small. TLO 5.3 Utilize the concept of normal distribution to solve related engineering problems.	Unit - V Probability Distribution 5.1 Binomial distribution. 5.2 Poisson's distribution. 5.3 Normal distribution.	Video ORANGE Chalk-Board Improved Lecture 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 Solve simple problems of Integration by substitution	1	*Integration by substitution	1	CO1
LLO 2.1 Solve integration using by parts	2	*Integration by parts	1	CO1
LLO 3.1 Solve integration by partial fractions(only linear non repeated factors at denominator of proper fraction).	3	Integration by partial fractions.	1	CO1
LLO 4.1 Solve examples on Definite Integral based on given methods.	4	Definite Integral based on given methods.	1	CO2
LLO 5.1 Solve problems on properties of definite integral.	5	*Properties of definite integral	1	CO2
LLO 6.1 Solve given problems for finding the area under the curve and volume of revolution.	6	* #Area under the curve and volume of revolution.(Only for Civil and Mechanical Engineering Group)	1	CO2
LLO 7.1 Solve examples on mean value and root mean square value.	7	* #Mean value and root mean square value. (Only for Computer, Electrical and Electronics Engineering Group)	1	CO2
LLO 8.1 Solve examples on order, degree and formation of differential equation.	8	Order, degree and formation of differential equation.	1	CO3
LLO 9.1 Solve first order first degree differential equation using variable separable method.	9	Variable separable method.	1	CO3
LLO 10.1 Solve first order first degree differential equation using exact differential equation and linear differential equation.	10	*Exact differential equation and linear differential equation.	1	CO3

APPLIED MATHEMATICS**Course Code : 312301**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Solve engineering application problems using differential equation.	11	*Applications of differential equations.(Take programme specific problems)	1	CO3
LLO 12.1 Solve problems on Bisection method and Regula falsi method.	12	*Bisection method and Regula falsi method.	1	CO4
LLO 13.1 Solve problems on Newton-Raphson method.	13	Newton- Raphson method.	1	CO4
LLO 14.1 Solve problems on Jacobi's method and Gauss Seidal Method.	14	Jacobi's method and Gauss Seidal Method.	1	CO4
LLO 15.1 Use Bakhshali iterative methods for finding approximate value of square root. (IKS)	15	*Bakhshali iterative methods for finding approximate value of square root. (IKS)	1	CO4
LLO 16.1 Solve engineering problems using Binomial distribution.	16	*Binomial Distribution	1	CO5
LLO 17.1 Solve engineering problems using Poisson distribution.	17	*Poisson Distribution	1	CO5
LLO 18.1 Solve engineering problems using Normal distribution.	18	Normal Distribution	1	CO5
LLO 19.1 Solve problems on Laplace transform and properties of Laplace transform.	19	* # Laplace transform and properties of Laplace transform.(Only for Electrical and Electronics Engineering Group)	1	CO2
LLO 20.1 Solve problems on Inverse Laplace transform and properties of Inverse Laplace transform.	20	* # Inverse Laplace transform and properties of Inverse Laplace transform.(Only for Electrical and Electronics Engineering Group)	1	CO2
Note : Out of above suggestive LLOs - <ul style="list-style-type: none"> • '* 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

- NA

Assignment

- NA

APPLIED MATHEMATICS**Course Code : 312301****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 judicious 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	Open-source software like wolfram alpha, SageMaths, MATHS3D, GeoGebra, Graph, DPLOT, and Graphing Calculator (Graph Eq2.13), ORANGE can be used for Algebra, Calculus, Trigonometry and Statistics respectively.	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	Indefinite Integration	CO1	15	2	6	12	20
2	II	Definite Integration	CO2	8	2	4	6	12
3	III	Differential Equation	CO3	8	2	4	6	12
4	IV	Numerical Methods	CO4	6	2	4	8	14
5	V	Probability Distribution	CO5	8	2	4	6	12
Grand Total				45	10	22	38	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Tests

Summative Assessment (Assessment of Learning)

- End Term Exam

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	3	1	-	-	1	-	1			

APPLIED MATHEMATICS**Course Code : 312301**

CO2	3	1	-	-	1	-	1			
CO3	3	2	1	1	1	1	1			
CO4	2	3	2	2	1	1	1			
CO5	2	2	1	1	2	1	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	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi, 2013 ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978- 81-224-1689-3
3	Kreysizg, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81- 265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN: 9788121903455
5	S. S. Sastry	Introductory Methods of Numerical Analysis	PHI Learning Private Limited, New Delhi. ISBN-978-81-203-4592-8
6	C. S. Seshadri	Studies in the History of Indian Mathematics	Hindustan Book Agency (India) P 19 Green Park Extension New Delhi. ISBN 978-93-80250-06-9
7	Marvin L. Bittinger David J. Ellenbogen Scott A. Sargent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
8	Gareth James, Daniela Witten, Trevor Hastie Robert and Tibshirani	An Introduction to Statistical Learning with Applications in R	Springer New York Heidelberg Dordrecht London ISBN 978-1-4614-7137-0 ISBN 978-1-4614-7138-7 (eBook)

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaddHoPig	Concept of Mathematics through video lectures and notes
3	https://www.wolframalpha.com/	Solving mathematical problems, performing calculations, and visualizing mathematical concepts.
4	http://www.sosmath.com/	Free resources and tutorials
5	http://mathworld.wolfram.com/	Extensive math encyclopedia with detailed explanations of mathematical concepts
6	https://www.mathsisfun.com/	Explanations and interactive lessons covering various math topics, from basic arithmetic to advanced
7	http://tutorial.math.lamar.edu/	Comprehensive set of notes and tutorials covering a wide range of mathematics topics.
8	https://www.purplemath.com/	Purplemath is a great resource for students seeking help with algebra and other foundational mathematics to improve learning.
9	https://www.brilliant.org/	Interactive learning in Mathematics
10	https://www.edx.org/	Offers a variety of courses
11	https://www.coursera.org/	Coursera offers online courses in applied mathematics from universities and institutions around the globe.

APPLIED MATHEMATICS**Course Code : 312301**

Sr.No	Link / Portal	Description
12	https://ocw.mit.edu/index.htm	The Massachusetts Institute of Technology (MIT) offers free access to course materials for a wide range of mathematical courses.

Note :

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

MSBTE Approval Dt. 01/10/2024**Semester - 2, K Scheme**

APPLIED SCIENCE**Course Code : 312308**

Programme Name/s : Automobile Engineering./ Agricultural Engineering/ Automation and Robotics/ Civil Engineering/
Civil & Rural Engineering/ Construction Technology/ Electrical Engineering/ Electrical Power System/
Instrumentation & Control/ Instrumentation/ Civil & Environmental Engineering/
Mechanical Engineering/
Mechatronics/ Production Engineering

Programme Code : AE/ AL/ AO/ CE/ CR/ CS/ EE/ EP/ IC/ IS/ LE/ ME/ MK/ PG

Semester : Second

Course Title : APPLIED SCIENCE

Course Code : 312308

I. RATIONALE

Diploma engineers have to deal with various processes, materials and machines. The comprehension of concepts and principles of Science like Elasticity, motion, Oscillation, Photoelectricity, X rays ,LASER, Nanomaterials, metals, alloys, water treatment ,fuel and combustion, cells and batteries will help the students to use relevant materials ,processes and methods for various engineering applications .

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to attain following industry/ employer expected outcome through various teaching learning experiences. Apply the principles of physics and chemistry to solve broad-based engineering problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Select relevant material in industries by analyzing its physical properties .
- CO2 - Apply the concept of simple harmonic motion , resonance and ultrasonic sound for various engineering applications.
- CO3 - Apply the concept of modern Physics (X-rays, LASER, Photosensors and Nanotechnology) for various engineering applications.
- CO4 - Use the relevant metallurgical processes in different engineering applications.
- CO5 - Use relevant water treatment processes to solve industrial problems.
- CO6 - Use appropriate fuel and electrolyte for engineering applications.

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			
				CL	TL	LL					Practical			SLA								
											FA-TH	SA-TH	Total	FA-PR	SA-PR	Max	Min	Max	Min			
312308	APPLIED SCIENCE	ASC	DSC	4	-	4	-	8	4	1.5	30	70*#	100	40	50	20	50@	20	-	-	200	

APPLIED SCIENCE**Course Code : 312308****Total IKS Hrs for Sem. : 4 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.

◆ **Candidate remaining absent in practical examination of any one part of Applied Science course i.e. Physics, Chemistry will be declare as Absent in Mark List and has to appear for examination. The marks of the part for which candidate was present will not be processed or carried forward.**

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	<p>TLO 1.1 Apply the concept of elasticity and plasticity to select the material for engineering applications.</p> <p>TLO 1.2 Establish relation between given types of moduli of elasticity.</p> <p>TLO 1.3 Predict the behavior of the given metallic wire.</p> <p>TLO 1.4 Explain the relevant Newton's laws of motion for the given moving object.</p> <p>TLO 1.5 Calculate the work, power, energy for the given situation.</p>	<p>Unit - I Properties of matter and kinematics</p> <p>1.1 Deforming Force and Restoring Force, Elasticity, Plasticity, Rigidity.</p> <p>1.2 Stress and Strain and their types, elastic limit and Hooke's law, types of moduli of elasticity.</p> <p>1.3 Stress -Strain diagram, Poisson's ratio, factors affecting elasticity</p> <p>1.4 Newton's laws of motion, and their applications.</p> <p>1.5 Angular displacement, angular velocity, angular acceleration, three equations of angular motion, projectile motion, trajectory, range of projectile angle of projection ,time of flight</p> <p>1.6 Work, power and energy: potential energy, kinetic energy, work –energy principle.</p>	<p>Improved lecture</p> <p>Video</p> <p>Demonstrations</p> <p>Model</p> <p>Demonstration</p>

APPLIED SCIENCE

Course Code : 312308

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	<p>TLO 2.1 Find the parameters required to analyze the given wave motion and simple harmonic motion.</p> <p>TLO 2.2 Explain the concept of resonance and its applications.</p> <p>TLO 2.3 Describe the properties of given ultrasonic waves.</p> <p>TLO 2.4 Explain the given method of production of ultrasonic waves .</p>	<p>Unit - II Waves and Oscillations</p> <p>2.1 Sound waves, amplitude, frequency, time - period, wave-length and velocity of wave, relation between velocity, frequency and time - period of wave.</p> <p>2.2 Simple Harmonic Motion , Uniform Circular Motion as Simple Harmonic Motion, Equation of simple harmonic motion , Phase of Simple Harmonic Motion.</p> <p>2.3 Resonance , Application of resonance.</p> <p>2.4 Resonance concept in prehistoric times, concept of different frequencies (Mantras) used to ignite different chakras in body (IKS).</p> <p>2.5 Ultrasonic waves, properties of ultrasonic waves.</p> <p>2.6 Piezoelectric and Magnetostriction method to produce ultrasonic waves .</p> <p>2.7 Applications of ultrasonic waves.</p>	<p>Improved lecture Demonstration Video Demonstrations</p>
3	<p>TLO 3.1 Explain properties of photon on basis Planck's hypothesis.</p> <p>TLO 3.2 Explain the construction and working of given photoelectric device.</p> <p>TLO 3.3 Explain the method to produce X-Rays with its properties and engineering applications.</p> <p>TLO 3.4 Differentiate between LASER and ordinary light.</p> <p>TLO 3.5 Explain the given terms related to LASER.</p> <p>TLO 3.6 Describe the properties of nanomaterials and its various applications.</p>	<p>Unit - III Modern Physics (Photoelectricity , X rays, LASER and nanotechnology)</p> <p>3.1 Planck's hypothesis, properties of photons.</p> <p>3.2 Photo electric effect: threshold frequency, threshold wavelength, stopping potential, Work function, characteristics of photoelectric effect, Einstein's photoelectric equation</p> <p>3.3 Photoelectric cell and LDR : principle ,Working and applications</p> <p>3.4 Production of X-rays by modern Coolidge tube, properties and engineering applications.</p> <p>3.5 Laser: properties, absorption, spontaneous and stimulated emission,</p> <p>3.6 Population inversion, active medium, optical pumping, three energy level system, He-Ne Laser.</p> <p>3.7 Engineering applications of Laser.</p> <p>3.8 Nanotechnology : Properties of nanomaterials (optical, magnetic and dielectric properties) , applications of nanomaterials, Metallic Bhasma (Ancient Ayurveda, IKS).</p>	<p>Improved lecture Presentations Demonstration Video Demonstrations</p>

APPLIED SCIENCE

Course Code : 312308

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	<p>TLO 4.1 Describe the extraction process of the ore.</p> <p>TLO 4.2 Explain Mechanical properties of metals.</p> <p>TLO 4.3 State purposes of making alloys.</p> <p>TLO 4.4 Describe methods of preparation of alloys.</p> <p>TLO 4.5 State Composition ,properties and applications of ferrous and nonferrous alloys.</p>	<p>Unit - IV Metals and Alloys</p> <p>4.1 Ancient Indian Metallurgy (IKS)</p> <p>4.2 Metals: Occurrence of metals in free and combined state. Basic concepts : Mineral, ore, gangue, flux and slag, metallurgy.</p> <p>4.3 Metallurgy:Extraction processes of metal from ore Concentration : Gravity separation, electromagnetic separation, froth floatation, calcination and roasting, Reduction : Smelting, aluminothermic process, Refining, poling , electrorefining.</p> <p>4.4 Mechanical properties of metals :Hardness, ductility, malleability, tensile strength, toughness, machinability, weldability, forging, soldering, brazing, castability.</p> <p>4.5 Alloys: Purposes of making alloys with examples.</p> <p>4.6 Preparation methods of alloys : Fusion, compression.</p> <p>4.7 Classification of alloys :Ferrous and non-ferrous alloys Ferrous alloys: Composition ,properties and applications of low carbon, medium carbon, high carbon steels. Non-ferrous alloy:Composition ,properties and applications of Brass, Bronze, Duralumin, Tinman Solder, Woods metal.</p>	<p>Chalk-Board Demonstration Case Study Video Demonstrations</p>
5	<p>TLO 5.1 Explain types of hardness of water.</p> <p>TLO 5.2 List salts causing temporary and permanent hardness to water.</p> <p>TLO 5.3 Describe boiler corrosion and caustic embrittlement.</p> <p>TLO 5.4 Explain the given type of water softening process.</p> <p>TLO 5.5 Describe the Wastewater treatment and potable water treatment.</p> <p>TLO 5.6 Solve numerical based on pH and pOH.</p>	<p>Unit - V Water Treatment</p> <p>5.1 Hard and soft water, causes of hardness, types of hardness</p> <p>5.2 Hard water in boilers and prevention: Boiler corrosion, caustic embrittlement, priming and foaming, scales and sludges, and methods of prevention of boiler corrosion.</p> <p>5.3 Methods of water softening: lime soda process (hot lime soda and cold lime soda process), zeolite process, ion exchange process.</p> <p>5.4 Potable water treatment: Sedimentation, coagulation, filtration and sterilization .</p> <p>5.5 Wastewater treatment: Sewage treatment, BOD and COD of sewage water.</p> <p>5.6 pH and pOH: Concept of pH, pOH, pH Scale, Numerical.</p>	<p>Chalk-Board Demonstration Case Study Video Demonstrations</p>

APPLIED SCIENCE

Course Code : 312308

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.
6	<p>TLO 6.1 Describe the properties of the given type of fuel.</p> <p>TLO 6.2 Describe Proximate analysis and Ultimate analysis of coal samples.</p> <p>TLO 6.3 Calculate the calorific value of the given solid fuel using Bomb calorimeter.</p> <p>TLO 6.4 Describe fractional distillation of crude petroleum.</p> <p>TLO 6.5 Explain properties of liquid fuels.</p> <p>TLO 6.6 Describe composition, properties of given gaseous fuel with their applications.</p> <p>TLO 6.7 Describe production of green hydrogen by electrolysis.</p> <p>TLO 6.8 Describe construction and working of given cells and batteries.</p>	<p>Unit - VI Fuels and Combustion</p> <p>6.1 Fuel: Calorific value and ignition temperature, classification.</p> <p>6.2 Solid fuels: Coal, Classification and composition , Proximate analysis, Ultimate analysis, Calorific value of coal by Bomb calorimeter.</p> <p>6.3 Liquid fuels: Fractional distillation of crude petroleum, boiling range, composition, propertie Knocking, cracking, octane number and cetane number.</p> <p>6.4 Gaseous fuels: Biogas, LPG, and CNG. Combustion equation of gaseous fuels, mass and volume of air required for complete combustion.</p> <p>6.5 Green hydrogen: Producing green hydrogen by electrolysis from renewable sources , Advantages and disadvantages of green hydrogen.</p> <p>6.6 Electrical conductance in metals and electrolytes, specific conductance, equivalent conductance, cell constant</p> <p>6.7 Cells and batteries :Construction ,working and applications of dry cell, lead acid storage cell H₂ - O₂ fuel cell, Ni-Cd battery and Lithium ion battery</p>	<p>Chalk-Board Demonstration Case Study Video Demonstrations</p>

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 Use Searle's method to determine the Young's modulus of given wire	1	* Determination of Young's modulus of given wire.	2	CO1
LLO 2.1 Compare young's moduli of different materials of wires .	2	Comparison of Young's moduli of given materials of wires.	2	CO1
LLO 3.1 Use of inclined plane to find the downward force.	3	* Determination of relationship between angle of inclination and downward force using inclined plane.	2	CO1
LLO 4.1 Use projectile motion to find the range from initial launch speed and angle	4	*Determination of range of projectile	2	CO1
LLO 5.1 Use helical spring to find force constant .	5	* Determination of force constant using helical spring .	2	CO2
LLO 6.1 Use resonance tube method to determine velocity of sound	6	* Determination of velocity of sound using resonance tube method.	2	CO2
LLO 7.1 Use Simple pendulum to find acceleration due to gravity .	7	* Determination of acceleration due to gravity by using simple pendulum .	2	CO2
LLO 8.1 Use ultrasonic distance – meter to measure distance of object .	8	Determination of distance of object using ultrasonometer.	2	CO2
LLO 9.1 Use ultrasonic interferometer to determine velocity of sound	9	Determination of velocity of ultrasonic sound waves in different liquids using ultrasonic interferometer .	2	CO2

APPLIED SCIENCE

Course Code : 312308

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 10.1 Use photo electric cell to find dependence of the stopping potential on the frequency of given light source.	10	Determination of the dependence of the stopping potential on the frequency of given light source .(Virtual Lab)	2	CO3
LLO 11.1 Determine I-V characteristics of the given photo electric cell.	11	* Determination of I-V characteristics of photoelectric cell.	2	CO3
LLO 12.1 Determine I-V characteristics of given light dependent resistor.	12	* Determination of I-V characteristics of LDR.	2	CO3
LLO 13.1 Find divergence of given laser .	13	Determination of the divergence of laser beam.	2	CO3
LLO 14.1 Use LASER beam to find the refractive index of glass plate	14	Determination of refractive index of glass plate using laser beam. (Virtual Lab)	2	CO3
LLO 15.1 Find the wavelength of given laser.	15	Determination of wavelength of helium neon laser (Virtual Lab)	2	CO3
LLO 16.1 Prepare KMnO ₄ solution. LLO 16.2 Prepare standard oxalic acid. LLO 16.3 Standardize KMnO ₄ solution.	16	Standardization of KMnO ₄ solution using standard oxalic acid and preparation of Fe alloy sample.	2	CO4
LLO 17.1 Set up titration Assembly. LLO 17.2 Record the observations. LLO 17.3 Calculate percentage of iron in haematite ore by titration method .	17	* Determination of the percentage of iron present in given Haematite ore by KMnO ₄ solution.	2	CO4
LLO 18.1 Prepare Cu ore sample. LLO 18.2 Calculate percentage of Cu .	18	* Determination of percentage of copper in given copper ore .	2	CO4
LLO 19.1 Prepare EDTA solution of known concentration. LLO 19.2 Determine total hardness of water by titration.	19	*Calculation of total hardness, temporary hardness and permanent hardness of water sample by EDTA method.	2	CO5
LLO 20.1 Prepare acid solution of known concentration. LLO 20.2 Determine alkalinity of water sample.	20	* Determination of the alkalinity of a given water sample.	2	CO5
LLO 21.1 Determine turbidity by using a Nephelometer or simulation.	21	Determination of turbidity of a given water sample by Nephelometric method by using Nephelometer or simulation.	2	CO5
LLO 22.1 Set up titration Apparatus LLO 22.2 Record the observations. LLO 22.3 Calculate dissolved oxygen.	22	Determination of dissolved oxygen in the given water sample.	2	CO5
LLO 23.1 Prepare AgNO ₃ Solution of known concentration. LLO 23.2 Calculate chloride content in water sample.	23	Determination of chloride content in the given water sample by Mohr's method.	2	CO5
LLO 24.1 Use universal indicator for PH values. LLO 24.2 Calculate PH value by using PH meter.	24	* Determination of pH value of given solution using pH meter and universal indicator.	2	CO5

APPLIED SCIENCE**Course Code : 312308**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 25.1 Use of oven for appropriate temperature settings. LLO 25.2 Calculate moisture and ash content in coal samples.	25	* Determination of the moisture and ash content in a given coal sample using proximate analysis.	2	CO6
LLO 26.1 Set up a Bomb Calorimeter. LLO 26.2 Calculate calorific value.	26	* Determination of calorific value of given solid fuel using Bomb calorimeter.	2	CO6
LLO 27.1 Use gravimetric analysis method LLO 27.2 calculate the percentage of Sulphur.	27	Calculate the percentage of Sulphur in a given coal sample by ultimate analysis. (Gravimetric analysis)	2	CO6
LLO 28.1 Standardize conductivity meter. LLO 28.2 Measure the conductance of given solutions.	28	Determination of conductance of given electrolyte by using a conductivity meter.	2	CO6
LLO 29.1 Set up conductometric titration assembly. LLO 29.2 Record conductance. LLO 29.3 Determine specific conductance and equivalence conductance.	29	* Determination of specific conductance and equivalence conductance of given salt sample solution.	2	CO6
LLO 30.1 Set up conductometric titration assembly. LLO 30.2 Record conductance. LLO 30.3 Determine equivalence point.	30	Determination of equivalence point of acetic acid and ammonium hydroxide using conductivity meter.	2	CO6
Note : Out of above suggestive LLOs -				
<ul style="list-style-type: none"> *1 Marked Practicals (LLOs) Are mandatory. Minimum 80% of above list of lab experiment are to be performed. Judicial mix of LLOs are to be performed to achieve desired outcomes. 				

VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING) : NOT APPLICABLE**VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Searle's apparatus(with slotted mass of 0.5 kg each)	1,2
2	Experimental setup for characteristics of LDR, optical bench .Source of light ,LDR .	11
3	Laser Source (He Ne, diode laser), optical bench , graph paper, glass plate	12,13,14
4	Nephelometer ; Auto-ranging from 20-200 NTU,+/- 2% of reading plus 0.1 NTU, power 220 Volts +/- 10% AC 50 Hz	21
5	pH meter reading up to pH14; ambient temp. -40 to 700 C.; pH/mV resolution:13 bit	24
6	Electric oven inner size 18"x18"x18"; temperature range 100 to 2500 C with the capacity of 40 lt.	25
7	Bomb calorimeter Temperature Resolution:0.001°C Oxygen Filling Automatic /Manual	26
8	Conductivity meter; conductivity range – 0.01 uS /cm to 200 mS/cm, Cell constant – digital 0.1 to 2.00; Temp. range – 0 to 100°C	28,29,30
9	An inclined plane , a trolley or a roller , pan , weight box , spring balance spirit level, strong thread , meter scale .	3
10	Retort stand, helical spring , 6 slotted weight of 50 grams ., scale , stop watch.	4
11	Resonance tube , Tuning forks of different frequencies	5
12	Metallic bob , strong thread , stopwatch .	6
13	Ultrasonometer	7

APPLIED SCIENCE**Course Code : 312308**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
14	ultrasonic interferometer	8
15	Experimental setup for characteristics of photoelectric cell	9,10
16	Electronic balance, with the scale range of 0.001g to 500g. pan size 100 mm; response time 3-5 sec.; power requirement 90-250 V, 10 watt.	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	Properties of matter and kinematics	CO1	9	3	4	4	11
2	II	Waves and Oscillations	CO2	10	3	5	4	12
3	III	Modern Physics (Photoelectricity , X rays, LASER and nanotechnology)	CO3	11	3	5	4	12
4	IV	Metals and Alloys	CO4	10	2	3	5	10
5	V	Water Treatment	CO5	8	3	4	4	11
6	VI	Fuels and Combustion	CO6	12	3	5	6	14
Grand Total				60	17	26	27	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Two unit tests of 30 marks (Physics 15 marks, Chemistry-15 marks) and average of two unit tests.
- For laboratory learning 50 marks (Physics 25 marks, Chemistry-25 marks).

Summative Assessment (Assessment of Learning)

- End semester assessment of 50 marks for laboratory learning (Physics 25 marks, Chemistry-25 marks).
- End semester assessment of 70 marks through online MCQ examination.

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	3	1	1	1	1	1	2			
CO2	3	1	1	1	1	1	2			
CO3	3	2	1	1	1	1	2			
CO4	3	1	-	1	2	2	1			
CO5	3	2	1	2	2	2	1			
CO6	3	1	-	1	2	2	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	Aryabhata	The Surya Siddhanta	Baptist mission press, Calcutta
2	Haliday, David; Resnik, Robert and Walker, Jearl	Fundamentals of Physics	John Wiley & sons, Hoboken, USA, 2014 ISBN : 812650823X.
3	Hussain Jeevakhan	Applied Physics II	Publisher: Khanna Book Publishing ISBN: 9789391505578.
4	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part I - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
5	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part II - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
6	Jain and Jain	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
7	Dara, S. S.	Engineering Chemistry	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660
8	Bagotsky V.S.	Fundamental of electrochemistry	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314.
9	Agnihotri Rajesh	Chemistry for Engineers	Wiley India Pvt. Ltd. New Delhi, 2014, ISBN: 9788126550784.
10	Anju Rawlley, Devdatta V. Saraf	Applied Chemistry with Lab Manual	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8
11	Vairam S.	Engineering Chemistry	Wiley India Pvt. Ltd. New Delhi, 2013, ISBN: 9788126543342

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.iberdrola.com/sustainability/green-hydrogen	Green hydrogen
2	https://vedicheritage.gov.in/vedic-heritage-in-present-content/metallurgy	Ancient indian metallurgy (IKS)
3	https://vlab.amrita.edu/?sub=2&brch=193&sim=575&cnt=4	Determine turbidity by using a simulation
4	https://www.britannica.com/science/metallurgy	Metals and alloy
5	https://phet.colorado.edu/en/simulations/ph-scale	PH and POH
6	https://archive.nptel.ac.in/courses/103/105/103105110/	Solid fuel
7	www.physicsclassroom.com	Concepts of Physics
8	www.fearofphysics.com	Fundamental terms in Physics
9	https://iksindia.org	IKS

Note :

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

ENGINEERING DRAWING**Course Code : 312311****Programme Name/s : Automobile Engineering./ Mechanical Engineering/ Mechatronics/ Production Engineering/****Programme Code : AE/ ME/ MK/ PG****Semester : Second****Course Title : ENGINEERING DRAWING****Course Code : 312311****I. RATIONALE**

Engineering drawing lays the foundation for visualizing the situation and delivering the essential instructions, required to carry out engineering jobs. This course aims at developing the ability to read and draw projection of lines, planes, solids. It also aims at reading and drawing the sections of the orthographic views. Engineering drawing also intends to develop the ability to visualize and draw curves of intersection and develop lateral surfaces of various solids

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use different drawing instruments for solving broad based engineering problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Apply principles of sectional orthographic projections for drawing given pictorial views.
- CO2 - Draw projection of lines and planes.
- CO3 - Draw projections of given solids for various orientations.
- CO4 - Interpret curves of intersection for given solids.
- CO5 - Draw development of lateral surfaces of various solids.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SL	LH	NLH			Theory			Based on LL & TL				Based on SL			
				CL	TL	LL						FA-TH	SA-TH	Total	Practical		SLA					
							Max	Min	Max						Min	Max	Min	Max	Min			
312311	ENGINEERING DRAWING	EDG	SEC	2	-	4	2	8	4	4	30	70	100	40	25	10	25@	10	25	10	175	

Total IKS Hrs for Sem. : 4 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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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 Draw different types of sectional views. TLO 1.2 Draw sectioning and hatching conventions. TLO 1.3 Develop sectional orthographic views from the pictorial views of given object. TLO 1.4 Interpret the given drawing.	Unit - I Sectional Orthographic Views 1.1 Cutting plane line. 1.2 Types of sectional views: Full Section, half section, Partial or Broken section, Revolved section, removed section, offset section, aligned section. 1.3 Sectioning conventions. 1.4 Hatching or section lines. 1.5 Conversion of pictorial views into sectional orthographic views (complete object involving slots, threads, ribs, etc).	Model Demonstration Video Demonstrations
2	TLO 2.1 Draw different position of lines with respect to projection planes. TLO 2.2 Draw projection of lines in various positions according to the given condition. TLO 2.3 Draw various types of planes based on their orientation. TLO 2.4 Draw projection of planes in various orientations according to the given condition.	Unit - II Projection of Lines and Planes 2.1 Projection of straight lines involving following positions- i. Parallel to both the planes. ii. Perpendicular to one plane. iii. Inclined to one plane and parallel to the other plane. iv. Inclined to both the planes. 2.2 Traces of line. 2.3 Projection of planes involving following orientations- i. Plane parallel to one principal plane and perpendicular to the other plane. ii. Plane inclined to one principal plane and perpendicular to the other plane.	Model Demonstration Video Demonstrations
3	TLO 3.1 Draw projection of given regular solids. TLO 3.2 Draw projection of regular solids according to their orientation with planes. TLO 3.3 Interpret orientation of axis with respect to projection of planes of solids.	Unit - III Projection of Solids 3.1 Types of solids. 3.2 Projection of following solids- i. Regular polyhedron – Tetrahedron, Hexahedron (Cube) ii. Regular Prisms and Pyramids- Triangular, Square. iii. Regular solids of revolution- Cylinder, Cone. 3.3 Projection of given solids With Axis a. Perpendicular to one of the principal projection plane. b. Inclined to one of the principal plane and parallel to the other. c. Parallel to both principal planes.	Model Demonstration Video Demonstrations
4	TLO 4.1 Interpret intersection for the given solids. TLO 4.2 Draw curves of intersection of the given solid combination.	Unit - IV Intersection of Solids 4.1 Curves of intersection of surfaces - Prism with Prism (Triangular, Square), Cylinder with cylinder. 4.2 Curves of intersection of surfaces - Square Prism with Cylinder when – i. Axes are at 90° and bisecting. ii. Axes are at 90° and offset. 4.3 Curves of intersection of surfaces - Cylinder with Cone: when the axis of cylinder is parallel to both the reference planes and cone resting on base on HP with axis intersecting and offset from axis of cylinder.	Model Demonstration Video Demonstrations Hands-on of the intersecting solids

ENGINEERING DRAWING**Course Code : 312311**

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 Draw development of lateral surfaces of the given solid. TLO 5.2 Identify parts where concept of development of the given surfaces is required. TLO 5.3 Draw development of given sheet metal.	Unit - V Development of Surfaces 5.1 Developments of lateral surfaces of cube, prisms (Triangular, Square), cylinder, pyramids (Triangular, Square), cone. 5.2 Applications of development of surfaces such as tray, funnel.	Model Demonstration Video Demonstrations Hands-on to develop lateral surface from the existing solids

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 Apply method of projection for drawing simple sectional orthographic views.	1	*Draw two problems on sectional orthographic projections (simple object) using first angle method of projection.	4	CO1
LLO 2.1 Apply method of projection for drawing simple sectional orthographic views.	2	*Draw two problems on sectional orthographic projections (object consisting of slot/rib/thread) using first angle method of projection.	4	CO1
LLO 3.1 Draw the projection of lines for the given positions of lines.	3	*Draw two problems on projection of lines showing the traces of line.	4	CO2
LLO 4.1 Draw the projection of planes for the given orientation of plane.	4	Draw two problems on projection of planes when plane is parallel to one principal plane and perpendicular to the other plane.	4	CO2
LLO 5.1 Draw the projection of planes for the given orientation of plane.	5	*Draw two problems on projection of planes when plane is inclined to one principal plane and perpendicular to the other plane.	4	CO2
LLO 6.1 Draw the projection of solids for the given position of plane.	6	*Draw any two problems on projection of solids with axis perpendicular to one of the principal projection planes.	4	CO3
LLO 7.1 Draw the projection of solids for the given position of plane.	7	*Draw any two problems on projection of solids with axis inclined to one of the principal plane and parallel to the other.	4	CO3
LLO 8.1 Draw the projection of solids for the given position of plane.	8	*Draw any two problems on projection of solids with axis parallel to both principal planes.	4	CO3
LLO 9.1 Draw the intersection of solids as per given situation.	9	Draw problems on intersection of solids when intersecting solids are -Prism with Prism, Cylinder with cylinder.	4	CO4
LLO 10.1 Draw the intersection of solids as per given situation.	10	*Draw problems on intersection of solids when intersecting solid is - Square Prism with Cylinder when . 1. Axes are at 90° and bisecting. 2. Axes are at 90° and offset.	4	CO4

ENGINEERING DRAWING**Course Code : 312311**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Draw the intersection of solids as per given situation.	11	*Draw problems on intersection of solids when intersecting solids are Cylinder with Cone and the axis of cylinder is parallel to both the reference planes and cone resting on base on HP with axis intersecting and offset from axis of cylinder.	4	CO4
LLO 12.1 Draw the developments of lateral surfaces of given object.	12	Draw problems on developments of lateral surfaces of cube, prisms.	4	CO5
LLO 13.1 Draw the developments of lateral surfaces of given object.	13	*Draw problems on developments of lateral surfaces of cylinder, pyramids.	4	CO5
LLO 14.1 Draw the developments of lateral surfaces of given object.	14	*Draw problems on developments of lateral surfaces of tray, funnel.	4	CO5
LLO 15.1 Collect information of an ancient Indian culture related to engineering drawing.	15	*Prepare a report on the use of various solid geometrical shapes employed in ancient Indian constructions (IKS).	4	CO1 CO2 CO3 CO4 CO5
Note : Out of above suggestive LLOs - <ul style="list-style-type: none"> * 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

- Sectional Orthographic projections. Minimum 5 problems
- Projection of Lines. Minimum 5 problems
- Projection of planes. Minimum 5 problems
- Projection of solids. One problem for each type of solids.
- Intersection of solids surfaces. One problem for each type of solids.
- Development of lateral surfaces of solids. One problem for each type of solids.

Micro project

- Student should collect fabricated job/component nearby workshop/industries/ and try to show curves of intersections for different solid surfaces.
- Each student will assess at least one sheet of other students (May be a group of 4 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.
- Students should collect component, job/sample from nearby workshops/industries and try to show the development of lateral surfaces of that.
- Each student should explain at least one problem for construction and method of drawing in sheet. Teacher will assign the problem of particular sheet to be explained to each student.

ENGINEERING DRAWING**Course Code : 312311****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 judicious 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	Models of objects for sectional orthographic.	1,2
2	Models/charts/ animated video of development of lateral surfaces of various solids.	12,13,14
3	Models/ Charts/ animated video of objects mentioned in unit no.2.	3,4,5
4	Models/charts/ animated video of projections of different solids.	6,7,8
5	Models/charts/ animated video of intersections of various solids.	9,10,11
6	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
7	Set of various industrial drawings being used by industries.	All
8	Drawing equipment and instruments for class room teaching-large size: T-square or drafter (Drafting Machine). Set squares (45°and 30°-60°) Protractor. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins / clips.	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	Sectional Orthographic Views	CO1	4	0	0	14	14
2	II	Projection of Lines and Planes	CO2	6	0	0	12	12
3	III	Projection of Solids	CO3	6	0	0	14	14
4	IV	Intersection of Solids	CO4	7	0	0	14	14
5	V	Development of Surfaces	CO5	7	0	0	16	16
Grand Total				30	0	0	70	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
- Tests

Summative Assessment (Assessment of Learning)

- End term exam- Theory
- End term exam- Practical (Lab Performance)

XI. SUGGESTED COS - POS MATRIX FORM

ENGINEERING DRAWING**Course Code : 312311**

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	3	3	-	2	-	2	2			
CO2	3	3	-	2	-	2	2			
CO3	3	3	-	2	-	2	2			
CO4	3	3	2	2	-	2	2			
CO5	3	3	2	2	-	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	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81-7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V. M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Agrawal Basant , Agrawal C.M.	Engineering drawing	McGraw Hill Education ,New Delhi, ISBN No. 978-1259062889
7	Narayana, K.L., Kannaiah. P.	Engineering Drawing	Scitech PublicationsIndia, Chennai ISBN No-978-8183714433
8	Singhania Nitin	Indian Art And Culture	McGraw Hill, ISBN No-978-9354601804

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/3VWnhRCF_0M	Sectional Orthographics
2	https://youtu.be/3WXPanCq9LI	Projection of lines
3	https://youtu.be/44glqyyw7OM	Projection of Plane
4	https://youtu.be/RE_ZG_SSsV8	Projection of solids
5	https://youtu.be/gIRsXiTKfDo	Projection of solids
6	https://youtu.be/q4uZYDtO05s	Projection of solids
7	https://youtu.be/rerGFp3V6W8	Intersection of solids
8	https://youtu.be/40pvNA0_sNM	Intersection of solids
9	https://youtu.be/P5oPrynRsTI	Development of lateral surfaces
10	https://youtu.be/vqk7SnpDQvg	Development of lateral surfaces

ENGINEERING DRAWING**Course Code : 312311**

Sr.No	Link / Portal	Description
Note : <ul style="list-style-type: none">Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

MSBTE Approval Dt. 01/10/2024**Semester - 2, K Scheme**

ENGINEERING MECHANICS**Course Code : 312312**

Programme Name/s : Automobile Engineering./ Agricultural Engineering/ Civil Engineering/ Chemical Engineering/
Civil & Rural Engineering/ Construction Technology/ Civil & Environmental Engineering/ Mechanical Engineering/
Mechatronics/ Production Engineering

Programme Code : AE/ AL/ CE/ CH/ CR/ CS/ LE/ ME/ MK/ PG

Semester : Second

Course Title : ENGINEERING MECHANICS

Course Code : 312312

I. RATIONALE

The analysis of forces acting on various structural and machine components using principles of mechanics enable to fetch the relevant data for detailing with design of structure/machine. The analysis of forces helps to prevent the defects, errors and subsequent failures arising in such elements under the action of forces. This course is designed for diploma aspirants to acquire and apply the basic discipline knowledge to solve the practical problems related with the design and detailing of components related to civil, mechanical, agricultural engineering etc.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply the principles of engineering mechanics to solve the given engineering problem(s)

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Select the suitable machine under given loading condition.
- CO2 - Analyze the given force system to calculate resultant force.
- CO3 - Determine unknown force(s) of given load combinations in the given situation.
- CO4 - Apply the laws of friction in the given situation.
- CO5 - Determine the centroid/centre of gravity of the given lamina.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TL				Based on SL						
				CL	TL	LL			Practical			FA-PR		SA-PR		SLA						
				Max	Max	Max	Max	Min	Max			Min	Max	Min	Max	Min	Max	Min				
312312	ENGINEERING MECHANICS	EGM	DSC	3	1	2	2	8	4	3	30	70	100	40	25	10	-	-	25	10	150	

ENGINEERING MECHANICS**Course Code : 312312****Total IKS Hrs for Sem. : 2 Hrs**

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	<p>TLO 1.1 Identify the type of machine based on efficiency of machine.</p> <p>TLO 1.2 Calculate effort required and load lifted by the given simple lifting machine.</p> <p>TLO 1.3 Verify law of machine for the given loading condition.</p> <p>TLO 1.4 Determine effort required along with efficiency for given machine with varying velocity ratio.</p>	<p>Unit - I Simple Lifting Machine</p> <p>1.1 Concept of simple lifting machine, load, effort, mechanical advantage, velocity ratio, efficiency of machines, reversible and non-reversible/self locking machines. (IKS*: Hand axe as wedge, Lever in battle, Inclined Plane for loading, Pulleys to lift water in irrigation)</p> <p>1.2 Concept of ideal machine and its conditions, machine friction, ideal effort, ideal load, effort lost in friction and load lost in friction, maximum mechanical advantage and maximum efficiency.</p> <p>1.3 Nature of graphs: Load vs. effort, load vs. ideal effort, load vs. MA, load vs. efficiency, Law of machine and its uses.</p> <p>1.4 Velocity ratios of inclined plane, Differential axle and wheel, Worm and worm wheel, Single purchase and double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block, two sheave pulley block, three sheave pulley block.</p>	<p>Chalk-Board</p> <p>Video</p> <p>Demonstrations</p> <p>Presentations</p> <p>Demonstration</p> <p>Hands-on</p> <p>Case Study</p>

ENGINEERING MECHANICS

Course Code : 312312

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	<p>TLO 2.1 Describe the characteristics of given type of force.</p> <p>TLO 2.2 Calculate the moment of forces in a given force system.</p> <p>TLO 2.3 Suggest the suitable law for the analysis of given force system.</p> <p>TLO 2.4 Determine the components of given force.</p> <p>TLO 2.5 Calculate analytically the resultant of given force system.</p> <p>TLO 2.6 Calculate graphically the resultant of given force system</p>	<p>Unit - II Analysis of Forces</p> <p>2.1 Introduction of Mechanics: Engineering Mechanics, Statics, Dynamics, Kinetics, Kinematics, concept of rigid body, Force: definition, unit, graphical representation, Bow's notation, characteristics, Types of force system</p> <p>2.2 Moment of force: Definition, unit, sign conventions, couple and its properties.</p> <p>2.3 Law related to forces: Law of transmissibility of force, Law of polygon of forces, Varignon's theorem of moments, Law of moment, Law of parallelogram of forces. (IKS*: Weighing scale in Mohenjodaro, Harappa)</p> <p>2.4 Resolution of coplanar forces: orthogonal and non orthogonal components of a force.</p> <p>2.5 Composition of coplanar forces using analytical method. Resultant of collinear, concurrent and non-concurrent force system.</p> <p>2.6 Composition of coplanar forces using graphical method. Resultant of concurrent force system and parallel force system consisting of maximum four forces only.</p>	<p>Chalk-Board</p> <p>Video</p> <p>Demonstrations</p> <p>Collaborative learning</p> <p>Presentations</p> <p>Hands-on</p> <p>Case Study</p>
3	<p>TLO 3.1 Draw the Free Body Diagram for given loading in given situation.</p> <p>TLO 3.2 Determine the equilibrant of the given concurrent force system.</p> <p>TLO 3.3 Use Lami's theorem to determine the unknown forces causing equilibrium for given practical situation.</p> <p>TLO 3.4 Identify the type of loading and beam in a given structure.</p> <p>TLO 3.5 Determine analytically the reactions in the given type of beam.</p>	<p>Unit - III Equilibrium of Forces</p> <p>3.1 Equilibrium and its conditions.</p> <p>3.2 Equilibrant and relation with resultant, Equilibrant of concurrent force system.</p> <p>3.3 Lami's Theorem and its applications, Concept of Free body diagram, (Problems having not more than two unknown.)</p> <p>3.4 Types of supports: fixed, simple, hinged and roller. Types of beams: cantilever, simply supported, overhanging, continuous and fixed. Types of loads: vertical and inclined point load, uniformly distributed load (UDL).</p> <p>3.5 Determination of Beam reactions using analytical method for cantilever, simply supported and overhanging beam subjected to vertical load, inclined load and uniformly distributed load (combination of any two types of loading).</p>	<p>Chalk-Board</p> <p>Video</p> <p>Demonstrations</p> <p>Presentations</p> <p>Site/Industry Visit</p> <p>Hands-on</p> <p>Case Study</p>
4	<p>TLO 4.1 Determine friction force along with coefficient of friction for the given condition.</p> <p>TLO 4.2 Describe the conditions for friction for the give situation.</p> <p>TLO 4.3 Draw FBD and analyze it for equilibrium of bodies on inclined plane in the given situation.</p> <p>TLO 4.4 Draw free body diagram for showing forces acting on a ladder under given condition.</p>	<p>Unit - IV Friction</p> <p>4.1 Friction and its relevance in engineering, types and laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, and their relationship.</p> <p>4.2 Equilibrium of bodies on level surface subjected to force (Pull and Push) parallel to plane and inclined to plane.</p> <p>4.3 Equilibrium of bodies on inclined plane subjected to force parallel to the plane only.</p> <p>4.4 Forces acting on ladder (only free body diagram, no numerical).</p>	<p>Chalk-Board</p> <p>Video</p> <p>Demonstrations</p> <p>Presentations</p> <p>Demonstration</p> <p>Case Study</p> <p>Hands-on</p>

ENGINEERING MECHANICS**Course Code : 312312**

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 Determine the centroid of given plane figure. TLO 5.2 Determine the centroid of given composite figure. TLO 5.3 Determine center of gravity of given solid. TLO 5.4 Determine Centre of gravity of the given composite solid.	Unit - V Centroid and Centre of Gravity 5.1 Centroid of geometrical plane figures: square, rectangle, triangle, circle, semi-circle, quarter circle (IKS*: Archery arrowheads in Ramayana, Arch in archeological structures such as Mahal, Gol Gumbaz). 5.2 Centroid of composite figures such as L, T, I, C, Z sections consisting of not more than three simple figures. 5.3 Centre of Gravity of simple solids: cube, cuboid, cylinder, cone, sphere and hemisphere (no hollow solids). 5.4 Centre of Gravity of composite solids composed of not more than two simple solids.	Chalk-Board Demonstration Video Demonstrations Model Demonstration Hands-on Case Study

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 relevant component of IKS from the given content.	1	Collect the photographic information of Indian knowledge system (IKS) given in various unit	2	CO1 CO2 CO5
LLO 2.1 Use the Differential Axle & Wheel to calculate relevant parameters under different loading condition.	2	*Determine mechanical advantage and velocity ratio of differential axle and wheel for different loading conditions.	2	CO1
LLO 3.1 Use the worm and worm wheel to calculate relevant parameters under different loading condition.	3	Determine mechanical advantage and velocity ratio of worm and worm wheel for different loading conditions.	2	CO1
LLO 4.1 Use the single or Double purchase crab winch to calculate relevant parameters under different loading condition.	4	Determine mechanical advantage and velocity ratio of single or Double purchase crab winch for different loading conditions.	2	CO1
LLO 5.1 Use the simple screw jack to calculate relevant parameters under different loading condition.	5	*Determine mechanical advantage and velocity ratio of simple screw jack for different loading conditions.	2	CO1
LLO 6.1 Use the Weston's differential pulley block to calculate relevant parameters under different loading condition.	6	Determine mechanical advantage and velocity ratio of Weston's differential pulley block for different loading conditions.	2	CO1
LLO 7.1 Use the geared pulley block to calculate relevant parameters under different loading condition.	7	Determine mechanical advantage and velocity ratio of geared pulley block for different loading conditions.	2	CO1
LLO 8.1 Use the two or three sheave pulley block to calculate relevant parameters under different loading condition.	8	Determine mechanical advantage and velocity ratio of two or three sheave pulley block for different loading conditions.	2	CO1
LLO 9.1 Use the universal force table to verify the law of polygon.	9	*Verify law of polygon of forces using Universal force table for given forces.	2	CO2
LLO 10.1 Use moment apparatus to verify the law of moment.	10	*Verify law of moment of forces using law of moment apparatus for given forces.	2	CO2
LLO 11.1 Use universal force table to verify the Lami's theorem.	11	*Verify the Lami's theorem using Universal force table apparatus for given forces.	2	CO3
LLO 12.1 Use the beam reaction apparatus to determine support reactions of the given simply supported beam.	12	*Determine support reactions of simply supported beam using beam reaction apparatus for given vertical loading.	2	CO3

ENGINEERING MECHANICS**Course Code : 312312**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 13.1 Use the horizontal plane friction apparatus for the given body to calculate coefficient of friction.	13	*Determine coefficient of friction using friction apparatus for given block on horizontal plane.	2	CO4
LLO 14.1 Use the inclined plane friction apparatus for the given body to calculate coefficient of friction.	14	Determine coefficient of friction using friction apparatus for given block on inclined plane.	2	CO4
LLO 15.1 Prepare a simple paper model of the given lamina to determine its centroid.	15	*Verify centroid of given plane lamina of by making simple paper model.	2	CO5

Note : Out of above suggestive LLOs -

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

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

- Collect photographs of specific simple lifting machine and relate these machines with the machines being studied and prepare models of simple lifting machines using tools in "MECHANO" and "MECHANIX"
- Prepare chart of types of forces showing real-life examples.
- Prepare chart or flex of laws related to engineering mechanics like law of moment, law of machine, law of parallelogram of forces, Varignon's theorem of moments etc.
- Prepare chart showing all types of beams having types of support (roller, hinged, fixed) with sketches and corresponding photographs of real-life examples.
- Prepare models of types of beam subjected to all loads (Point load, UDL, UVL, moment, couple) with sketches and corresponding photographs of real-life examples.
- Prepare photographic chart showing real life examples of uses of friction on horizontal (walking, writing, etc.) and inclined plane (slider in gardens, loading of heavy material in trucks etc.).
- Collect minimum Ten sample of materials having different coefficient of friction.
- Prepare a chart showing comparison of centroid and center of gravity for square-cube, rectangle-cylinder, triangle-cone, circle-sphere, semicircle-hemisphere.
- Prepare a models of solids like square, rectangle triangle, circle, semicircle, cube, cuboid, cylinder, cone, sphere, hemisphere.

Assignment

- Solve the examples on calculation of values of MA, VR, Pi, Pf, Wi, Wf, law of machine etc. for given type of machine.
- Solve the examples on calculation of orthogonal or non-orthogonal components of a force.
- Solve the examples on calculation of moments of a force from given problem statement or figure.
- Solve the examples on calculation of resultant for given force system from given problem statement or figure.
- Solve the examples on calculation of unknown forces using Lamis theorem from given problem statement or figure.
- Solve the examples on calculation of support reactions of given beam from given problem statement or figure.
- Solve the examples on calculation of coefficient of friction, normal reaction, force required to pull or push the block for given case of frictional bodies (horizontal or inclined plane).
- Solve the examples on calculation of centroid of simple/composite plane figures from given problem statement or figure.
- Solve the examples on calculation of center of gravity for simple/composite solid bodies from given problem statement or figure.

ENGINEERING MECHANICS**Course Code : 312312****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 judicious 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	Simple axle and wheel (wall mounted unit with the wheel of 40 cm diameter and axles are in steps of 20 cm and 10 cm reducing diameter .	1
2	Law of moment's apparatus consisting of a stainless steel graduated beam 12.5 mm square in section, 1m long, pivoted at centre.	10,11
3	Beam Reaction apparatus (The apparatus is with two circular dial type 10 kg.)	15
4	Friction apparatus for motion along horizontal and inclined plane (base to which a sector with graduated arc and vertical scale is provided. The plane may be clamped at any angle up to 45 degrees. pan. Two weight boxes (each of 5 gm, 10 gm, 2-20 gm, 2-50 gm, 2-100 gm weight)	16,17
5	Models of geometrical figures.	18
6	Differential axle and wheel (wall mounted unit with the wheel of 40 cm diameter and axles are in steps of 20 cm and 10 cm reducing diameter .	2
7	Worm and worm wheel (wall mounted unit with threaded spindle, load drum, effort wheel; with necessary slotted weights, hanger and thread)	3
8	Single Purchase Crab winch (Table mounted heavy cast iron body. The effort wheel is of C.I. material of 25 cm diameter mounted on a shaft of about 40mm dia. On the same shaft a geared wheel of 15 cm dia.	4
9	Double Purchase Crab winch (Having assembly same as above but with double set of gearing arrangement.)	5
10	Simple screw Jack (Table mounted metallic body , screw with a pitch of 5 mm carrying a double flanged turn table of 20 cm diameter.	6
11	Weston's Differential pulley block (consisting of two pulleys; one bigger and other smaller.	7
12	Weston's Differential worm geared pulley block (Consists of a metallic (preferably steel) cogged wheel of about 20 cm along with a protruded load drum of 10 cm dia. to suspend the weights of 10 kg, 20 kg-2 weights and a 50 kg weights)	8
13	Universal Force Table (Consists of a circular 40 cm dia. Aluminum disc, graduated into 360 degrees.) with all accessories.	9,14

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	Simple Lifting Machine	CO1	9	2	8	4	14
2	II	Analysis of Forces	CO2	13	2	4	12	18
3	III	Equilibrium of Forces	CO3	9	2	8	4	14
4	IV	Friction	CO4	7	2	4	6	12
5	V	Centroid and Centre of Gravity	CO5	7	2	4	6	12
Grand Total				45	10	28	32	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Term work (Lab Manual), Self-Learning (Assignment) Question and Answers in class room, quiz and group discussion. Note: Each practical will be assessed considering-60% weightage to process related and 40 % weightage to product related.

Summative Assessment (Assessment of Learning)

- Practical Examination, Oral Examination, Pen and Paper Test.

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	1	1	2	1	-	1			
CO2	2	2	1	2	1	-	1			
CO3	2	2	1	2	1	-	1			
CO4	2	2	2	2	1	-	1			
CO5	2	2	1	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	S. Ramamrutham	Engineering Mechanics	Dhanpat Rai Publishing Co. 2016 ISBN-13: 978-9352164271
2	R. S. Khurmi, N.Khurmi	Engineering Mechanics	S.Chand & Co. New Delhi 2018 ISBN: 978-9352833962
3	S. S. Bhavikatti	Engineering Mechanics	New Age International Private Limited ISBN: 978-9388818698
4	D. S. Bedi, M. P. Poonia	Engineering Mechanics	Khanna Publishing ISBN-13:978-9386173263
5	Dr. R. K. Bansal	Engineering Mechanics	Laxmi Publications ISBN 13: 9788131804094

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.engineersrail.com/simple-lifting-machine/	Introduction of simple lifting machine
2	https://youtu.be/JnYVz1TSmBQ	Law of machine and types of machines useful in industry.
3	https://youtu.be/vWXIQYRXewc	Introduction to engineering mechanics

ENGINEERING MECHANICS**Course Code : 312312**

Sr.No	Link / Portal	Description
4	https://www.youtube.com/watch?v=6u_rjLjv-MY&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=3	Introduction of force system with examples
5	https://www.youtube.com/watch?v=Fudcc0JoXdo&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=4	Resolution and composition of forces
6	https://youtu.be/iy8l6vUm0iw	System of Forces
7	https://www.youtube.com/watch?v=tM5hsUiNpGA	Calculation of beam reactions for various types of beams
8	https://www.youtube.com/watch?v=RGT1g_lu440	Calculation of coefficient of friction for horizontal and inclined plane
9	https://youtu.be/L_ABGYA8HFA	Friction
10	https://youtu.be/ET3ioTDFpfA	Moment of Force
11	https://econtent.msbt.edu.in/econtent/econtent_home.php	Engineering Mechanics
<p>Note :</p> <ul style="list-style-type: none"> Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students 		

MSBTE Approval Dt. 01/10/2024**Semester - 2, K Scheme**

MANUFACTURING TECHNOLOGY**Course Code : 312313**

Programme Name/s : Automobile Engineering./ Mechanical Engineering/ Mechatronics/ Production Engineering/
Programme Code : AE/ ME/ MK/ PG
Semester : Second
Course Title : MANUFACTURING TECHNOLOGY
Course Code : 312313

I. RATIONALE

Diploma graduates frequently encounter diverse manufacturing processes. This core manufacturing technology course aims to enhance student's comprehension of manufacturing methods, like turning, drilling, milling, casting, forming, and joining, etc.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Produce a given component using various manufacturing processes.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Produce a part using a lathe and drilling machine as per given drawing.
- CO2 - Produce a part using a milling machine as per given drawing.
- CO3 - Produce a part using casting processes as per given drawing.
- CO4 - Produce a part using forming processes as per given drawing.
- CO5 - Produce a part using joining processes as per given drawing..

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH	Theory			Based on LL & TL		Based on SL								
				CL	TL	LL			Practical			SLA										
									FA-TH			SA-TH	FA-PR	SA-PR	Max	Min	Max	Min				
312313	MANUFACTURING TECHNOLOGY	MPR	DSC	3	-	4	1	8	4	3	30	70	100	40	25	10	25@	10	25	10	175	

Total IKS Hrs for Sem. : 1 Hrs

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

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

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

MANUFACTURING TECHNOLOGY**Course Code : 312313**

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	<p>TLO 1.1 List various angles of single point cutting tool.</p> <p>TLO 1.2 List accessories of lathe machine and their function.</p> <p>TLO 1.3 Calculate machining parameters for given component.</p> <p>TLO 1.4 Describe construction and specification of a drilling machine.</p> <p>TLO 1.5 List various drilling operations</p>	<p>Unit - I Fundamentals of Lathe and drilling machines</p> <p>1.1 Basics of Machining: Single point cutting Tool and its nomenclature, Mechanics of Chip formation, Types of Chips.</p> <p>1.2 Lathe machine: Classification, specification of centre lathe; Basic parts and accessories like chucks (three jaw, four jaw, and magnetic chuck), mandrels, rests, faceplate, centres and angle plate of centre lathe and their functions.</p> <p>1.3 Lathe operations: facing, plain turning, taper turning, thread cutting, chamfering, grooving, knurling and cutting parameters like speed, feed, depth of cut and machining time.</p> <p>1.4 Drill machine: Classification, specification of drilling machine Basic parts of radial drilling machine, Sensitive drilling and their function.</p> <p>1.5 Drilling machine operations: Drilling, reaming, boring, counter sinking, counter boring, spot facing and Cutting parameters- speed, feed, depth of cut and machining time.</p>	<p>Model Demonstration Video Demonstrations</p>
2	<p>TLO 2.1 Demonstrate working of milling machines.</p> <p>TLO 2.2 Select appropriate milling cutter for given component.</p> <p>TLO 2.3 Describe milling operations for given component.</p> <p>TLO 2.4 Illustrate procedure of indexing methods.</p>	<p>Unit - II Milling Machines</p> <p>2.1 Milling Machine: Working principle, types of milling machines.</p> <p>2.2 Milling cutter: Different types of cutters, face milling cutters end milling cutters, staggered tooth milling cutter, side and face milling cutter, form milling cutters and metal slitting saw.</p> <p>2.3 Milling Process: Plain milling, face milling, side milling, end milling, straddle milling, gang milling, up and down milling.</p> <p>2.4 Dividing head; Types, function of dividing head, method of indexing.</p>	<p>Model Demonstration Video Demonstrations</p>
3	<p>TLO 3.1 Describe significance of pattern allowances.</p> <p>TLO 3.2 Describe moulding methods.</p> <p>TLO 3.3 Classify casting processes.</p> <p>TLO 3.4 Enumerate safety guidelines and precautions for a foundry workshop.</p>	<p>Unit - III Casting processes</p> <p>3.1 Pattern making: Basic steps in making pattern, types, materials and allowances, Color coding of pattern.</p> <p>3.2 Moulding: Types and properties of moulding sands, moulding methods, cores and core prints, gating and risering system.</p> <p>3.3 Casting: Casting in Indus valley civilization (IKS), Centrifugal casting, investment casting, shell moulding and applications, Casting defects-causes and remedies.</p> <p>3.4 Safety practices/ precautions in foundry shop.</p>	<p>Chalk-Board Model Demonstration Video Demonstrations</p>
4	<p>TLO 4.1 Select the relevant forming process for given component.</p> <p>TLO 4.2 Differentiate rolling and forging process.</p> <p>TLO 4.3 List various press tool operations for given component.</p> <p>TLO 4.4 Enumerate safety guidelines and precautions for a forging/press shop</p>	<p>Unit - IV Forming processes</p> <p>4.1 Drop forging: Introduction to forging, upset forging, Press forging, open die and closed die forging operations.</p> <p>4.2 Rolling: Principle of rolling, hot and cold rolling and applications, rolling mill.</p> <p>4.3 Press tool: Various operations performed on press, press tool, simple, progressive and forming dies and applications.</p> <p>4.4 Safety practices/ precautions in forging and press shop.</p>	<p>Chalk-Board Model Demonstration</p>

MANUFACTURING TECHNOLOGY**Course Code : 312313**

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	<p>TLO 5.1 Select suitable welding process for given component.</p> <p>TLO 5.2 Describe gas welding process.</p> <p>TLO 5.3 Differentiate various arc welding processes.</p> <p>TLO 5.4 Compare soldering and brazing process.</p> <p>TLO 5.5 List causes of welding defects and suggest remedies.</p> <p>TLO 5.6 Enumerate safety guidelines and precautions for a welding shop.</p>	<p>Unit - V Metal joining processes</p> <p>5.1 Welding Processes: welding and weldability, types and classification of welding processes.</p> <p>5.2 Gas welding: gas welding equipments, oxy-acetylene welding, types of flame.</p> <p>5.3 Arc welding: arc welding equipment equipments, flux shielded metal arc welding, TIG and MIG welding.</p> <p>5.4 Soldering and brazing process, Comparison, fillers, merits, demerits and applications.</p> <p>5.5 Defects in welding joints: causes and remedies.</p> <p>5.6 Safety practices/ precautions in welding shop.</p>	Chalk-Board Demonstration

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
<p>LLO 1.1 Setup a lathe machine for given job as per operations.</p> <p>LLO 1.2 Select suitable cutting parameters for operations as per given job.</p> <p>LLO 1.3 Prepare a turning job as per given drawing.</p>	1	*Produce a job on a lathe machine that comprises facing, plain turning and step turning operations as per the given drawing.	4	CO1
<p>LLO 2.1 Setup a lathe machine for taper turning operations.</p> <p>LLO 2.2 Calculate taper angle for taper turning operations as per given job.</p> <p>LLO 2.3 Prepare a taper turning job as per given drawing.</p>	2	*Produce a job on a lathe machine that comprises taper turning and grooving operations as per the given drawing.	4	CO1
<p>LLO 3.1 Setup a lathe machine for chamfering and knurling operations.</p> <p>LLO 3.2 Select suitable cutting parameters for chamfering and knurling operations.</p> <p>LLO 3.3 Prepare a chamfering and knurling job as per given drawing.</p>	3	*Produce a job on a lathe machine that comprises knurling and chamfering operations as per the given drawing.	4	CO1
<p>LLO 4.1 Setup a drill machine for given job as per operations.</p> <p>LLO 4.2 Prepare a drilling job as per given drawing.</p>	4	*Produce a job on a drilling machine comprising drilling and reaming operations as per the given drawing.	4	CO1
<p>LLO 5.1 Setup a drill machine and tool for given job as per operations.</p> <p>LLO 5.2 Prepare a tapping job as per given drawing.</p>	5	*Produce a job on drilling machine comprising tapping operation as per the given drawing.	4	CO1

MANUFACTURING TECHNOLOGY**Course Code : 312313**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Setup a drill machine and tool for given job as per operations. LLO 6.2 Prepare a counter-boring job as per given drawing.	6	Produce a job on a drilling machine comprising counter-boring operation as per the given drawing.	4	CO1
LLO 7.1 Setup a milling machine and cutter for given job. LLO 7.2 Prepare a job on milling machine as per the given drawing.	7	Produce a job on a milling machine that comprises of plain milling operation as per the given drawing.	4	CO2
LLO 8.1 Setup a milling machine and side milling cutter for given job. LLO 8.2 Prepare a job on milling machine as per the given drawing.	8	Produce a job on a milling machine that comprises of side milling operation as per given drawing.	4	CO2
LLO 9.1 Setup a milling machine and cutter for given job. LLO 9.2 Use dividing head for indexing. LLO 9.3 Prepare a spur gear on milling machine as per the given drawing.	9	*Produce a spline shaft with 3 slots using indexing mechanism as per the given drawing.	4	CO2
LLO 10.1 Select material and tool for preparing pattern. LLO 10.2 Prepare wooden pattern as per given drawing.	10	*Produce a simple wooden pattern for the given component.	4	CO3
LLO 11.1 Choose appropriate sand and tools for moulding a given pattern. LLO 11.2 Prepare a mould for given pattern.	11	*Produce a sand mould for the given pattern.	4	CO3
LLO 12.1 Select suitable material and melt it for required casting. LLO 12.2 Prepare casting as per given drawing.	12	*Produce a casting from the given mould.	4	CO3
LLO 13.1 Identify various components of forging machine. LLO 13.2 Enlist various forging operations. LLO 13.3 Identify need of safety while working in forging shop.	13	Demonstrate components of a forging machine and its safety considerations.	4	CO4
LLO 14.1 Select tool for producing given job. LLO 14.2 Prepare a bolt head/a cold chisel/hook as per given drawing.	14	*Produce a bolt head/cold chisel/hook using forging.	4	CO4
LLO 15.1 Identify various components of rolling mill/machine. LLO 15.2 Enlist rolling methods used in industries. LLO 15.3 Identify need of safety while working rolling shop.	15	Demonstrate the various parts of rolling mill/machine and various safety aspects of it.	4	CO4

MANUFACTURING TECHNOLOGY**Course Code : 312313**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Identify various components of Press tool. LLO 16.2 Identify type of die used for production of washer. LLO 16.3 Identify need of safety while working in press shop.	16	Demonstrate production process of washer.	2	CO4
LLO 17.1 Prepare material for fabricating structure. LLO 17.2 Select suitable equipment and tool for welding. LLO 17.3 Fabricate structure as per given drawing.	17	*Fabricate structure using arc welding machine as per given drawing.	4	CO5
LLO 18.1 Prepare joint for soldering/brazing by applying flux. LLO 18.2 Perform soldering/brazing operations on the given components.	18	*Perform soldering/brazing operations on the given components.	2	CO5
LLO 19.1 Enlist various welding defects and their causes. LLO 19.2 Identify casting defects in the given welded joints.	19	Identify various welding defects from given castings.	2	CO5
Note : Out of above suggestive LLOs - <ul style="list-style-type: none"> • '* 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

- Justify why lathe machine is called mother of all machines.
- Collect information regarding car bonnet manufacturing in automobile industry.
- Collect information of material used for preparation of pattern.
- Justify necessity of safety precaution in industries.
- Prepare a list of machine tools seen in the industry during industrial visit.

Micro project

- Collect specifications of machine tools available in the industry you have visited.
- Prepare a list of similar operations that can be performed on different machine tools along with their specifications.
- Collect different welding equipments required for a welding shop.
- Collect a information about operations required for key manufacturing.
- Prepare a list of machine tools available in the workshop of the institute with their specifications.

MANUFACTURING TECHNOLOGY**Course Code : 312313****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 judicious 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	Centre lathe machine. (Length between canters 1000 mm, swing 500 mm)	1,2,3
2	Pattern making, moulding and casting shop with necessary equipment.	10,11,12
3	Mini forging press (Capacity upto 1 ton)	13,14
4	Rolling mill (Laboratory type)	15
5	Mini press tool (Capacity upto 1 ton)	16
6	TIG/MIG welding equipment (upto 160 A, 240 Volts)	17,18,19
7	Drilling Machine (drill diameter up to 40 mm)	4,5,6
8	Column and knee type milling machine along with dividing head (length X width of working table 1000 mm X 500)	7,8,9

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Fundamentals of Lathe and drilling machines	CO1	10	4	6	6	16
2	II	Milling Machines	CO2	9	4	6	6	16
3	III	Casting processes	CO3	9	2	6	4	12
4	IV	Forming processes	CO4	8	2	4	4	10
5	V	Metal joining processes	CO5	9	4	8	4	16
Grand Total				45	16	30	24	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)**

- Tests
- Seminar/Presentation
- Term Work

Summative Assessment (Assessment of Learning)

- Practical

MANUFACTURING TECHNOLOGY**Course Code : 312313**

- Theory

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	3	2	2	2	-	2	2			
CO2	3	2	2	2	-	2	2			
CO3	3	2	2	2	-	2	2			
CO4	3	2	2	2	-	2	2			
CO5	3	2	2	2	-	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	P N RAO	Manufacturing Technology Vol-1	McGraw Hill, New Delhi. ISBN-1259062570, 9781259062575
2	P N RAO	Manufacturing Technology Vol-2	McGraw Hill, New Delhi, ISBN: 9789353160524
3	S K Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy	Elements Of Workshop Technology Vol-1	Media Propoters & Publisher PVT. LMT. ISBN-13 5551234102415
4	S K Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy	Elements Of Workshop Technology Vol-2	Media Propoters & Publisher PVT. LMT., ISBN: 978-8-185-09915-6.
5	D.P. Agrawal	Ancient Metal Technology and Archaeology of South Asia: a Pan-Asian perspective	Aditya Prakashan, New Delhi. ISBN: 9788173051777

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=Wc2gpWcmGK4	Lathe Machine Operations
2	https://www.youtube.com/watch?v=DGsV6RhBnbM	Radial drilling machine
3	https://www.youtube.com/watch?v=zzXdddrV2so	Simple Job on milling machine
4	https://www.youtube.com/watch?v=2CIcvB72dmk	Basics of Metal Casting
5	https://www.youtube.com/watch?v=-w7E88zox6w	Closed die forging
6	https://www.youtube.com/watch?v=RyLvVMg84xs	Basics of welding process

Note :

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

MANUFACTURING TECHNOLOGY

Course Code : 312313

MSBTE Approval Dt. 01/10/2024

Semester - 2, K Scheme