Maharashtra State Board Of Technical Education, Mumbai

Learning and Assessment Scheme for Post H.S.C Diploma Cources

Programme Name	**: Diploma In Surface Coating Technology**		
Programme Code	**: SC**	**With Effect From Academic Year**	**: 2023-24**
Duration Of Programme	**: 6 Semester**	**Duration**	**: 16 WEEKS**
Semester	**: First**	**Scheme**	**: K**

Sr No	Course Title	Abbrevation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme										
						Actual Contact Hrs./Week			Self Learning (Term Work + Assignemnt)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory				Based on LL & TL				Based on Self Learning		Total Marks
																	Practical						
						CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
1	BASIC SURFACE COATING MATERIAL SYNTHESIS	BMS	DSC	321001	0	-	-	4	2	6	3		-	-	-	-	50	20	50@	20	25	10	125
2	COMMUNICATION SKILLS (ENGLISH)	ENG	AEC	311303	0	3	-	2	1	6	3	3	30	70	100	40	25	10	-	-	25	10	150
3	FUNDAMENTALS OF ICT	ICT	SEC	311001	0	1	-	2	1	4	2		-	-	-	-	25	10	25@	10	25	10	75
4	INDUSTRIAL CHEMISTRY	INC	DSC	321306	0	2	-	2	2	6	3	3	30	70	100	40	25	10	25@	10	25	10	175
5	PIGMENT TECHNOLOGY	PTE	DSC	321305	4	3	-	3	2	8	4	3	30	70	100	40	25	10	50#	20	-	-	175
6	RESIN TECHNOLOGY	RTE	DSC	321304	0	3	-	3	2	8	4	3	30	70	100	40	25	10	50@	20	-	-	175
7	YOGA AND MEDITATION	YAM	VEC	311003	1	-	-	1	1	2	1		-	-	-	-	25	10	-	-	25	10	50
Total					**5**	**12**	**0**	**17**	**11**	**40**	**20**		**120**	**280**	**400**		**200**		**200**		**125**		**925**

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

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

Note :

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

Course Category : Discipline Specific Course Core (DSC) : 4, Discipline Specific Elective (DSE) : 0, Value Education Course (VEC) : 1, Intern./Apprenti./Project./Community (INP) : 0, AbilityEnhancement Course (AEC) : 1, Skill Enhancement Course (SEC) : 1, GenericElective (GE) : 0

BASIC SURFACE COATING MATERIAL SYNTHESIS **Course Code : 321001**

Programme Name/s : **Surface Coating Technology**
Programme Code : **SC**
Semester : **First**
Course Title : **BASIC SURFACE COATING MATERIAL SYNTHESIS**
Course Code : **321001**

I. RATIONALE

Material synthesis in the coating industry is a multidisciplinary field that requires expertise in chemistry, materials science, chemical engineering, and surface technology. Coatings are thin layers of material applied to surfaces to provide protective, decorative, or functional properties. Synthesis of material involve various stages like formulating the composition, actual synthesis and material characterization. Inclusion of this course will enable students to apply principles of basic raw materials and machines used in surface coatings and material synthesis. It also helps students to understand practices followed in coating industries. It also provides opportunities for hands-on practices for real industrial situations. The Student will also get familiarize with the raw materials, working mechanisms of machines for preparation of various coating materials.

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: Prepare, test, and apply coating materials as per industrial requirements.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Identify type of corrosion.
- CO2 - Test properties of oil.
- CO3 - Prepare oleoresinous varnishes.
- CO4 - Design a set-up of machine for coating preparation.
- CO5 - Use colorants.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
321001	BASIC SURFACE COATING MATERIAL SYNTHESIS	BMS	DSC	-	-	4	2	6	3		-	-	-	-	50	20	50@	20	25	10	125

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 Classify corrosion TLO 1.2 Explain Corrosion mechanism TLO 1.3 Surface preparation methods for corroded parts.	**Unit - I Corrosion** 1.1 Define corrosion and Classification of corrosion. 1.2 Chemical reactions in various types of corrosion. 1.3 Types of rust remover and corrosion inhibitors 1.4 Synthesis of rust remover and corrosion inhibitors 1.5 Properties and applications of rust remover and corrosion inhibitors	Demonstration Chalk-Board
2	TLO 2.1 Enlist sources of oils TLO 2.2 Classify oils TLO 2.3 Explain drying mechanism of oils.	**Unit - II Oils** 2.1 Sources of oils. 2.2 Types of oils. 2.3 Chemical composition of oils. 2.4 Drying mechanism of oils. 2.5 Application of oil in surface coatings.	Chalk-Board Demonstration
3	TLO 3.1 Explain types of varnishes. TLO 3.2 Write properties and applications of varnishes.	**Unit - III Oleoresinous Varnishes** 3.1 Need of varnishes 3.2 Types of varnishes (Ester gum, calcium rosinate, penta-ester gum) 3.3 Properties of varnishes 3.4 Applications of varnishes	Chalk-Board Demonstration
4	TLO 4.1 Draw a high speed stirrer. TLO 4.2 Explain working mechanism of ball mill. TLO 4.3 Explain uses of spray booth	**Unit - IV Equipment for Paint Industries** 4.1 Use of High speed stirrer in paint manufacutring. 4.2 Principle of Ball mill. 4.3 Working mechanism of Sand mill. 4.4 Classification of Oven. 4.5 Applications of spray booths	Chalk-Board Demonstration
5	TLO 5.1 Define Shade TLO 5.2 Classify colorants TLO 5.3 Write applications of colorants.	**Unit - V Colourants** 5.1 Introduction to shade and shade matching. 5.2 Types of colorants. 5.3 Testing of colorants. 5.4 Applications of colorants.	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
LLO 1.1 Identify corroded jobs	1	Identify corroded jobs in the workshop.	4	CO1
LLO 2.1 Use mechanical methods for removal of corrosion.	2	Use mechanical methods for removal of corrosion.	4	CO1
LLO 3.1 Use chemical methods for removal of corrosion.	3	Use chemical methods for removal of corrosion.	4	CO1
LLO 4.1 Determine acid value of oils.	4	Determine acid value of oils.	4	CO2
LLO 5.1 Determine ester value of oils.	5	Determine ester value of oils.	4	CO2
LLO 6.1 Determine saponification value of oils.	6	Determine saponification value of oils.	4	CO2
LLO 7.1 Test color, clarity, viscosity of oils.	7	Test color, clarity, viscosity of oils.	4	CO2
LLO 8.1 Measure specific gravity and moisture content of oils.	8	Measure specific gravity and moisture content of oils.	4	CO2
LLO 9.1 Evaluate ester gum.	9	Evaluate ester gum.	4	CO3
LLO 10.1 Evaluate ester gum varnish.	10	Evaluate ester gum varnish.	4	CO3
LLO 11.1 Prepare and test penta-ester gum.	11	Prepare and test penta-ester gum.	4	CO3
LLO 12.1 Prepare and test penta-ester gum varnishes.	12	Prepare and test penta-ester gum varnishes.	4	CO3
LLO 13.1 Synthesize calcium rosinate.	13	Synthesize calcium rosinate.	4	CO3
LLO 14.1 Synthesize calcium rosinate varnishes.	14	Synthesize calcium rosinate varnishes.	4	CO3
LLO 15.1 Prepare rust remover	15	Prepare rust remover	4	CO1
LLO 16.1 Design a set for paint making using ball mill.	16	Design a set for paint making using ball mill.	4	CO4
LLO 17.1 Design a set for paint making using sand mill.	17	Design a set for paint making using sand mill.	4	CO4
LLO 18.1 Formulate water based colorants.	18	Formulate water based colorants.	4	CO5
LLO 19.1 Formulate based colorants.	19	Formulate solvent based colorants.	4	CO5
LLO 20.1 Test universal colorants.	20	Test universal colorants.	4	CO5
LLO 21.1 Prepare a corrosion inhibitors	21	Prepare a corrosion inhibitors	4	CO1
Note : Students are required to complete minimum 10 number of practical attain desired level of psychomotor skills				

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

Micro project

- Make a photo album of various type of machines used in coating industries.
- Design a model for paint spray booth
- Prepare a report need of colorant for shade matching.
- Collect the information on different types of processed oils in surface coating.

Assignment

- Collect the information of metals as per corrosion rate.
- Prepare album of different types of corrosion.
- Carry out the survey of colorant and varnish manufacturing industries

- Write the report on different types of oils used in surface coating industries.
- Make a chart of different surface preparation methods.

Term work

- Prepare journal for laboratory work.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Weighing Balance (Digital Display, 300 g, Sensitivity. 0.01 g)	All
2	Metal Panels (MS panel, 75*100*0.8mm)	1
3	Sand paper grinder	2
4	Heating mantle (upto 300 OC)	3,9,10,11,12,13,14
5	Brookfield viscometer (RVT/LVT)	7
6	Ovens (Max temp-250 o C)	8
7	Specific gravity bottle (10 ml/25 ml)	8
8	Ball mill (1lit capacity)	16
9	Sand Mill (1 lit capacity)	17
10	Spray booth	15
11	Stirrer (Variable speed drive)	19,20

IX. SUGGESTED FOR 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	Corrosion	CO1	0	0	0	0	0
Grand Total				**0**	**0**	**0**	**0**	**0**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Mid term tests
- Assignment,
- Self-learning
- Terms work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End of Term Examination
- Viva-voce
- Demonstration

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	-	2			
CO2	2	1	-	2	2	-	2			
CO3	3	2	1	2	1	-	2			
CO4	3	1	-	1	1	-	2			
CO5	3	1	-	-	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
1	V.C. Malshe and Meenal Sikchi	Basics of Paints Technology Part I	Antar Prakash Centre for Yoga, 2004 ISBN: 9788190329859
2	W. M. Morgan	Outlines of Paint Technology (3rd Edition)	CBS Publishers & Distributors Pvt. Ltd, 2000 ISBN: 9788123904306
3	Oil and Colour Chemists Association of Australia St (OCCA)	Surface Coatings, Vol I: Raw Materials and Their Usage	Chapman & Hall, 1993 ISBN: 9780412552106
4	H. F. Payne	Organic Coating Technology	John Wiley & Sons Inc (1961) ISBN: 9780471673538
5	Thomas H. Applewhite	Bailey`s Industrial Oil and Fat Products III	John Wiley and Sons New York
6	Oil & Colour Chemists Association	Paint Technology Manuals part Three Convertible Coatings II	Chapman and Hall
7	Dr. Swaraj Paul	Surface Coatings: Science & Technology (2nd Edition)	John Wiley and Sons Ltd.2014 ISBN:9788126552559
8	Asia Pacific Business Press Inc. 2007 ISBN: 8178330881	Modern Technology of Paints, Varnishes & Lacquers (2nd Edition)	NIIR Board

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=p40jM9kzeis	Theories and types of corrosion
2	https://www.youtube.com/watch?v=UpfG3HqhcWg	Mechanism of Corrosion
3	https://www.youtube.com/watch?v=b97rQNU1OhI	Oils classification
4	https://www.youtube.com/watch?v=QbHutAfdHfU	DRYING MECHANISM OF OILS
5	https://www.youtube.com/watch?v=ZgfDlEdnAlw	Varnishes
6	https://www.youtube.com/watch?v=syqZtOiIGlQ	Colourants
7	https://www.youtube.com/watch?v=Sl8xMkeAzus	High speed lab disperser
8	https://www.youtube.com/watch?v=u7S3pOxAw5Y	Ball mill size reduction
9	https://www.youtube.com/watch?v=1KfiIB1BzF8	Sand mill
10	https://www.youtube.com/watch?v=ab-XvpG5PBM	Automobile painting process

MSBTE - Final Copy Dt.09.08.2023 **1K**

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 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/ 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/EP/ET/EX/FC/HA/IC/IE/IF/IH/IS/IX/IZ/LE/ME/MK/ML/M**
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

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 & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
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
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	CO3
LLO 6.1 Add depth to narratives LLO 6.2 Form grammatically correct sentences	6	Compose situational dialogues (Any Two)	2	CO3
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	CO1 CO3
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	CO1 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	CO1 CO3

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 14.1 Reflect on thoughts, feelings, and experiences	14	Write your experience in 50 words on (Four) given situations (Diary Entry)	2	CO3 CO5
LLO 15.1 Develop language acquisition	15	Respond to the questions based on the given passages	2	CO2
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 : Any 12 out of 16 practicals are compulsory				

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
- 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

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 FOR 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

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
1	MSBTE	Spectrum, G Scheme and I- Scheme	MSBTE
2	Kumar, E. Suresh, Sreehari, P Savitri	Effective English with CD	Pearson Education

Sr.No	Author	Title	Publisher
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

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 & Tele-communication Engg./ 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/ 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/EP/ET/EX/FC/HA/HM/IC/IE/IF/IH/IS/IX/IZ/LE/ME/MK/ML/M**

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

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
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.
1	TLO 1.1 Explain the functions of components in the block diagram of computer system. TLO 1.2 Classify the given type of software TLO 1.3 Explain characteristics of the given type of network TLO 1.4 Describe application of the given type of network connecting device TLO 1.5 Describe procedure to manage a file /folder in the given way.	**Unit - I Introduction to Computer System** 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 1.2 Internal components: processor, motherboards, random access memory (RAM), read-only memory (ROM), video cards, sound cards and internal hard disk drives) 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 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 1.5 Network environments: network interface cards, hubs, switches, routers and modems, concept of LAN, MAN, WAN, WLAN, Wi-Fi and Bluetooth 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.	Hands-on Demonstration Presentations
2	TLO 2.1 Write steps to create the given text document. TLO 2.2 Explain the given feature for document editing. TLO 2.3 Explain the given page setup features of a document. TLO 2.4 Write the given table formatting feature. TLO 2.5 Write the steps to set the given type of document layout	**Unit - II Word Processing** 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. 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 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 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 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 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	Hands-on Demonstration Presentations
3	TLO 3.1 Write steps to create the given spreadsheet. TLO 3.2 Explain the given formatting feature of a worksheet. TLO 3.3 Write steps to insert formula and functions in the given worksheet. TLO 3.4 Write steps to create charts for the given data set. TLO 3.5 Explain steps to perform data filter, sort and validation operations on the given data set. TLO 3.6 Write steps to setup and print a spreadsheet.	**Unit - III Spreadsheets** 3.1 Working with Spreadsheets: Overview of workbook and worksheet, Create Worksheet Entering sample data, Save, Copy Worksheet, Delete Worksheet, Close and open Workbook. 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 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 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. 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. 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.	Hands-on Demonstration Presentations
4	TLO 4.1 Write the steps to create the given slide presentation. TLO 4.2 Write the steps to insert multiple media in the given presentation. TLO 4.3 Explain the method of including animation, transition effects in slide show. TLO 4.4 Write steps to apply table features in the given presentation TLO 4.5 Write steps to manage charts in the given presentation	**Unit - IV Presentation Tool** 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 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 4.3 Working with Tables: Insert a Table in a Slide, Format Tables, and Import Tables from Other Office Applications. 4.4 Working with Charts: Insert Charts in a Slide, Modify a Chart, Import Charts from Other Office Applications.	Hands-on Demonstration Presentations
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

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
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

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.

Assignment

- Prepare journal of practical performed in the laboratory.

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.

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 FOR 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

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
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
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

INDUSTRIAL CHEMISTRY **Course Code : 321306**

Programme Name/s : Surface Coating Technology
Programme Code : SC
Semester : First
Course Title : INDUSTRIAL CHEMISTRY
Course Code : 321306

I. RATIONALE

Industrial chemistry is a branch of chemistry that focuses on the application of chemical principles and processes to the development and improvement of industrial processes and products. It plays a crucial role in the manufacturing sector, where chemical transformations are utilized on a large scale to produce various goods efficiently and economically. Industrial chemistry plays a vital role in various industries, including surface coating industries and allied industry sector. Through this course, the students will familiarize with quantitative analysis, water purification methods, electro chemistry, sealant and underbody and waterproofing materials used in surface coating industries.

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: • Apply principles of industrial chemistry in the field of surface coating materials to perform various tests for surface coating application

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Perform quantitative analysis through volumetric and gravimetric estimation
- CO2 - Purify water for its application in surface coating
- CO3 - Apply electrochemical principal for surface coating applications
- CO4 - Use sealants and underbody coatings appropriately
- CO5 - Use water proofing chemicals in various construction materials

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
321306	INDUSTRIAL CHEMISTRY	INC	DSC	2	-	2	2	6	3	3	30	70	100	40	25	10	25@	10	25	10	175

Total IKS Hrs for Sem. : 0 Hrs
Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Explain volumetric and gravimetric analysis. TLO 1.2 Explain the term Normality, Molarity and Molality. TLO 1.3 Describe types of Titrations TLO 1.4 Prepare solution of different strengths for quantitative analysis	**Unit - I Quantitative Analysis** 1.1 Basic Concepts, definition & significance of atomic weight, molecular weight & equivalent weight of materials. 1.2 Concept of Solutions- Primary & Secondary solution , Concepts of Molar solutions, Molal solutions and Normal solutions, 1.3 Introduction to volumetric and gravimetric analysis. 1.4 Types of titrations, Concept of pH, Types of Indicators, Selection of Indicators, 1.5 Calculations in volumetric analysis.	Video Demonstrations Presentations Chalk-Board
2	TLO 2.1 Explain softening of water. TLO 2.2 List various water pollutants. TLO 2.3 Explain municipal water purification.	**Unit - II Water Technology** 2.1 Conditioning, purification and softening of water. 2.2 Water pollution and various water pollutants. 2.3 Methods of conditioning, Ion exchange resin, demineralization, distillation process, 2.4 Municipal water purification. 2.5 IS-10500, IS-3025	Video Demonstrations Presentations Chalk-Board
3	TLO 3.1 Compare electrochemical and electrolytic cell. TLO 3.2 Explain Faraday’s law of electrolysis TLO 3.3 Describe applications of electrochemistry in coating industries.	**Unit - III Electrochemistry** 3.1 Introduction to Electro chemistry. 3.2 Introduction to Anode, Cathode and their reactions. 3.3 Faraday’s laws of electrolysis. 3.4 Electro chemical series. 3.5 Applications of Electrochemistry in various industries including surface coating industries	Video Demonstrations Presentations Chalk-Board

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 Classify adhesives. TLO 4.2 Explain properties and applications of sealant and adhesives. TLO 4.3 Describe properties and applications of underbody.	**Unit - IV Sealant and underbody** 4.1 Introduction to adhesives, sealants and automotive underbody coatings. 4.2 Types of adhesives, sealants and automotive underbody coatings. 4.3 Requirement of adhesives, sealants and automotive underbody coatings. 4.4 General methods of applications. 4.5 Properties and applications of adhesives, sealants and automotive underbody coatings.	Video Demonstrations Presentations Chalk-Board
5	TLO 5.1 Explain properties and requirements of construction chemicals TLO 5.2 Explain requirements of construction chemicals. TLO 5.3 Write applications of waterproofing chemicals.	**Unit - V Construction chemicals** 5.1 Introduction to construction chemicals. 5.2 Types of construction chemicals. 5.3 Properties and requirements of construction chemicals. 5.4 Applications of water proofing chemicals in construction industries.	Video Demonstrations Presentations Chalk-Board

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 Prepare indicator.	1	Preparation of indicator. (Phenolphthalein/Methyl orange)	2	CO1
LLO 2.1 Prepare primary standard solution.	2	Preparation of primary standard solution. (Oxalic acid/ Sodium carbonate)	2	CO1
LLO 3.1 Prepare standard solution of various normalities.	3	Standardization of solution of different normalities.(KOH/NaOH/H2SO4/HCl)	2	CO1
LLO 4.1 Determine hardness of water.	4	Determination of hardness of water.	2	CO2
LLO 5.1 Measure alkalinity of water.	5	Measurement of alkalinity of water. (Phenolphthalein/Methyl orange)	2	CO2
LLO 6.1 Test conductivity of water using conductivity meter.	6	Testing of conductivity of water using conductivity meter.	2	CO2
LLO 7.1 Prepare distilled water.	7	Preparation of distilled water using simple distillation method.	2	CO2
LLO 8.1 Demonstrate Faraday's Law of electrochemistry	8	Demonstration of Faraday's Law of electrochemistry using Hull cell.	2	CO3
LLO 9.1 Determine the rate of corrosion in acidic solution.	9	Determinatioin of rate of corrosion in acidic solution by weight loss method.	2	CO3
LLO 10.1 Demonstrate electroplating process.	10	Demonstration of electroplating process (Copper/Nickel/Zinc)	2	CO3
LLO 11.1 Test adhesive strength of adhesive	11	Testing of adhesive strength of adhesive	2	CO4
LLO 12.1 Test drying time of adhesive.	12	Testing of adhesive for its drying time.	2	CO4
LLO 13.1 Record color and clarity of construction chemicals.	13	Recording of color and clarity of construction chemicals.	2	CO5
LLO 14.1 Calculate water absorptivity for water proofing materials	14	Calculation of water absorptivity for water proofing materials	2	CO5
LLO 15.1 Test the viscosity of waterproofing chemicals.	15	Testing of viscosity of waterproofing chemicals.	2	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
Note : Students are expected to complete any 12 number of practical during the semester to attain desired psychomotor skill.				

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

Term Work

- Prepare journal for laboratory work.

Micro project

- Compare minerals present in potable water and waste water. (Prepare a report and presentation)
- Collect the information of equipment available in the lab with their principle, material of construction calibration technologies. (Prepare a Report and presentation)
- Design a flow sheet of water purification method.
- Conduct a survey and prepare a report on waste water treatment plant.
- Prepare a report on different construction chemicals used in construction industries.
- Collect the information of equipment available in the lab with their principle, material of construction calibration technologies ((Prepare a Report and presentation)
- Determine hardness and pH of water samples from different places. (Prepare a report and presentation)
- Conduct industrial survey for sealant and underbody manufacturing and application industries. (Prepare a report and presentation)
- Collect the data of electroplating processes. (Prepare a report and presentation)

Assignment

- Prepare a chart of indicators and primary standards.
- Write water conditioning methods.
- Collect information on applications of underbody and sealant.
- Conduct a survey of water conditioning plants.
- Prepare a report on different electrochemical processes.
- Prepare a report on waterproofing methodologies used in construction industries.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Weighing Balance (Digital Display, 300 g, Sensitivity. 0.01 g)	All
2	Flow Cup B-4	15
3	Stop Watch (Analogue)	15
4	Metal Panels (MS panel, 75*100*0.8mm)	8,9,10,11,12
5	Brush (Soft Brush, 1” rectangular)	12
6	Water Condenser (1-2 ft.*0.5")	7
7	Conductivity meter (2-200 mS)	6
8	Distillation flask/Distillation set up (1-5 Lit)	7
9	Rheostat/Rectifier (0-240V)	8
10	Oven (300 OC)	All
11	Thermometer (310 OC)	All
12	Heating mantle (300OC)	7
13	Brookfield Viscometer (RV/LV model)	15

IX. SUGGESTED FOR 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	Quantitative Analysis	CO1	8	2	4	8	14
2	II	Water Technology	CO2	6	2	4	8	14
3	III	Electrochemistry	CO3	6	2	4	8	14
4	IV	Sealant and underbody	CO4	6	2	4	8	14
5	V	Construction chemicals	CO5	6	2	4	8	14
Grand Total				**32**	**10**	**20**	**40**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Mid term tests
- Assignment
- Terms work
- Seminar/Presentation

Summative Assessment (Assessment of Learning)

- End of Term Examination
- Viva-voce
- 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	1	-	2	1	1	1			
CO2	2	2	1	-	2	1	1			
CO3	3	2	1	-	1	1	1			
CO4	3	2	-	-	3	1	1			
CO5	2	1	1	-	3	3	1			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher
1	Arthur I. Vogel	Quantitative Inorganic Analysis	Woolwich Polytechnic, London ISBN-10: 9780582463219
2	Thos H Durrans	Solvents, Oils, Resins& Driers	London ISBN 9781295455638
3	R. Norris Shreve	Chemical Process Industries	McGraw-Hill Book Company London ISBN-10: 0070858144
4	V. S. Bagotsky	Fundamentals of Electrochemistry	John Wiley & Sons, Inc., Hoboken, New Jersey ISBN-13 978-0-471-70058-6

Sr.No	Author	Title	Publisher
5	Dr.R.P.Rethaliya	Concrete Technology	Charotar Publishing House Pvt. ISBN-978-93-80358-20-8
6	Metcalf and Eddy	Wastewater Engineering Treatment and Reuse	Tata Mc-Graw Hill Publishing Company Limited New Delhi ISBN- 0-07-0495394
7	Anju Rawlley, Devdatta V.Saraf	Applied Chemistry with Lab Manual	Khanna Book Publishing Co.(P) Ltd. New Delhi,ISBN-978-93-91505-44-8

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/UHYfgwjE2i4	Introduction to the Modern Instrumental Methods of Analysis
2	https://youtu.be/3He784vumas	Industrial Inorganic Chemistry
3	https://youtu.be/AvqYHCuOxLU	Standards and Volumetric/Gravimetric titrations
4	https://youtu.be/piLczemdEQ0	Introduction to distillation, binary equilibrium diagrams and concept of relative volatility
5	https://youtu.be/Xf8qqGZGBTI	Ion Exchange Processes
6	https://youtu.be/z4-V9IzGmpg	Ion Exchange,Advanced Oxidation Processes
7	https://youtu.be/Q_eAIJLxo_g	Polymer Basics, Polymers used in Membrane Preparation and their Properties
8	https://youtu.be/6qrTUDEL6XY	Advantages of RO, fouling, RO applications, Pressure retarded osmosis
9	https://youtu.be/F9hmmbtrZ9Y	Problems and solutions based on RO & MF
10	https://youtu.be/ksxQUE32AmA	The Laws of Electrochemistry and Electrolysis
11	https://youtu.be/nEZGWFFV0ik	Numerical Problems on Faraday's Laws of Electrolysis
12	https://youtu.be/oTDNByEts3M	Waterproofing of concrete structures
13	https://youtu.be/Ehaebx_3v1I	Waterproofing of concrete structures - 2
14	https://youtu.be/g2K6PXxtyB4	Adhesives and Paints
15	https://youtu.be/wOyQBVfM1eo	Basic Construction materials

PIGMENT TECHNOLOGY **Course Code : 321305**

Programme Name/s : Surface Coating Technology
Programme Code : SC
Semester : First
Course Title : PIGMENT TECHNOLOGY
Course Code : 321305

I. RATIONALE

Pigments play a crucial role in the world of art, design, and everyday life, providing color and visual appeal to various materials. They are finely ground substances that are used to impart color to paints, inks, plastics, textiles, cosmetics, and numerous other products. Pigments are dyes are different in solubility aspects as dyes are soluble in solvent and pigments are insoluble and remain on the surface. This course will give basic knowledge about pigments and their applications. This course will deal with white, black and extender pigments. This will facilitate the student to select the relevant pigment for coating formulation. This course will include the types of pigments, properties and uses. This course also facilitate the students perform various testing of pigments.

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: • Use relevant pigments for various applications.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Classify pigments.
- CO2 - Explain pigment manufacturing methods.
- CO3 - Write properties and applications of extenders.
- CO4 - Test properties of white pigments.
- CO5 - Write properties and applications of black pigments.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
321305	PIGMENT TECHNOLOGY	PTE	DSC	3	-	3	2	8	4	3	30	70	100	40	25	10	50#	20	-	-	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
Legends: @ Internal Assessment, # External Assessment, *# On Line Examination , @$ Internal Online Examination
Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Classify pigments. TLO 1.2 List applications of pigments. TLO 1.3 State physical and chemical properties of pigments.	**Unit - I History and modern era of pigments (IKS)** 1.1 Use of natural colors and dyes in ancient times. 1.2 History of pigments, dyes and colors. 1.3 Classification of Pigments. 1.4 Application of pigments in coatings. 1.5 Difference between pigments and extenders. 1.6 General Properties, Evaluation of Pigments as per IS: 33 & 34	Chalk-Board Video Demonstrations Presentations
2	TLO 2.1 Select raw materials for manufacturing of pigments. TLO 2.2 Describe the parameters affecting on the pigment’s properties. TLO 2.3 Describe stages of pigment manufacturing.	**Unit - II Pigment Manufacturing methods** 2.1 General methods of pigment manufacturing. 2.2 Stages involved in the manufacturing. 2.3 Dry and wet Grinding techniques. 2.4 Sampling & Blending of Pigments. 2.5 Concept of aggregates, agglomerates and individual particles.	Video Demonstrations Presentations Chalk-Board
3	TLO 3.1 Describe the raw materials for manufacturing of various extenders TLO 3.2 Explain properties of various extenders. TLO 3.3 Explain application area of various extenders.	**Unit - III Extenders** 3.1 Properties and applications of compounds of Calcium. 3.2 Properties and applications of compounds of Magnesium. 3.3 Properties and applications of compounds of Barium. 3.4 Properties and applications of compounds of Aluminum. 3.5 Properties and applications of compounds Silicates.	Chalk-Board Presentations Video Demonstrations

Sr.No	Theory Learning Outcomes (TLO's)aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
4	TLO 4.1 State properties of white pigments. TLO 4.2 Describe manufacturing processes. TLO 4.3 Compare properties of interior & exterior pigments.	**Unit - IV White Pigments** 4.1 Raw material for TiO2 manufacturing. 4.2 TiO2 manufacturing methods. 4.3 Properties and uses of TiO2. 4.4 Pigment surface modification. 4.5 Composition, Properties & uses of Zinc Oxide and Zinc Phosphate.	Chalk-Board Presentations Video Demonstrations
5	TLO 5.1 List the raw material. TLO 5.2 Describe various types of black pigments. TLO 5.3 Describe manufacturing process TLO 5.4 Compare carbon with other black pigments	**Unit - V Black Pigments** 5.1 Introduction, types, composition of black pigments. 5.2 Methods of black pigments manufacturing. 5.3 Properties and application of Black pigments. 5.4 Dispersion of black pigments. 5.5 Comparison of organic and inorganic black pigments. 5.6 Properties and application of Black pigments.	Chalk-Board Presentations Video Demonstrations

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 Measure bulk density of pigment.	1	Measure bulk density of pigment using taping method as per IS-33.	3	CO1
LLO 2.1 Measure specific gravity of pigments.	2	Measure specific gravity of pigments using Specific Gravity bottle as per IS-33.	3	CO1
LLO 3.1 Determine oil absorption of pigments.	3	Determine oil absorption of pigments by rub down method as per IS-33.	3	CO1
LLO 4.1 Determine residue by sieves analysis.	4	Determine residue using 45-micron sieves as per IS-33 .	3	CO1
LLO 5.1 Determine residue by sieves analysis.	5	Measure hiding power of true pigments using Morest chart.	3	CO2
LLO 6.1 Prepare pigment powder.	6	Prepare pigment powder using physical method.	3	CO2
LLO 7.1 Prepare pigments.	7	Prepare pigments using chemical methods.	3	CO2
LLO 8.1 Prepare drawdown of pigment using automatic muller.	8	Prepare drawdown of pigment using automatic muller.	3	CO2
LLO 9.1 Determine moisture content of extenders.	9	Determine moisture content of extenders by heating method.	3	CO3
LLO 10.1 Compare heat resistance of the pigments.	10	Compare heat resistance of the extender pigments using oven.	3	CO3
LLO 11.1 Test pH of extenders.	11	Test pH of extenders using water suspension method.	3	CO3
LLO 12.1 Compare hiding power of extenders and true pigments.	12	Compare hiding power of extenders and true pigments using Morest chart.	3	CO3
LLO 13.1 Determine reducing strength of pigments.	13	Determine reducing strength of white pigments.	3	CO4
LLO 14.1 Determine acid resistance of pigment.	14	Determine acid resistance of white pigment.	3	CO4
LLO 15.1 Determine alkali resistance of pigment.	15	Determine alkali resistance of white pigment.	3	CO4

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 16.1 Determine bleeding of pigments.	16	Determine bleeding of pigments.	3	CO5
LLO 17.1 Determine tinting strength of pigments.	17	Determine tinting strength of black pigments.	3	CO5
LLO 18.1 Measure oil absorption	18	Measure oil absorption of black pigments	3	CO5
Note : Students are expected to complete any 12 number of practical during the semester to attain desired psychomotor skill.				

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

Micro project

- Make a portfolio of MSDS of various reagents, chemicals and pigments used in laboratories.
- Design a chart of various modifications of pigments with properties influenced due to modification.
- Conduct a survey of pigment industries.
- Design a model for pigments manufacturing processes.
- Compare various organic and In-Organic pigments.
- Collect information of surface treatment processes for pigments.
- Prepare a album of various synthetic and natural pigments.

Assignment

- Prepare a chart of classifications of pigments.
- Write name of raw materials for pigment synthesis with structures.
- Enlist the properties and applications of pigments.

Term work

- Prepare journal for laboratory work.

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Spatula	All
2	Glass Plate	All
3	Weighing balance	All
4	Automatic Muller	4,7,10,12,13,14,15,17,18
5	Puller Spatula	4,8,10,12,13,14,15,17
6	pH meter	11
7	Stirrer Assembly	11
8	Petri dish	9,14,15,18
9	Beaker (50 ml, 100 ml)	3,6,7,10,11,13,14,15,16,18
10	Conical Flask (50 ml, 100 ml)	11,14,15
11	Oven	6,9,10,14,15
12	Thermometer (0-100 0C, 0-360 0C range)	10
13	Sieve analysis set	5,6
14	Measuring Cylinder (50 CC, 100 CC)	1
15	Sp. Gr. Bottle	2
16	Test tube set	6
17	Morest chart	4,7,12
18	Jar mill	6

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
19	Glass Rod	3

IX. SUGGESTED FOR 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	History and modern era of pigments (IKS)	CO1	10	2	4	8	14
2	II	Pigment Manufacturing methods	CO2	10	2	4	8	14
3	III	Extenders	CO3	10	2	4	8	14
4	IV	White Pigments	CO4	10	2	4	8	14
5	V	Black Pigments	CO5	8	2	4	8	14
Grand Total				**48**	**10**	**20**	**40**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Assignment
- Mid term tests
- Seminar/Presentation
- Terms work

Summative Assessment (Assessment of Learning)

- End of Term Examination
- Viva-voce
- Demonstration

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

Sr.No	Author	Title	Publisher
1	Kishore M. Shah	Handbook of Synthetic Dyes and Pigments	Edu-tech publishing co.,1994 ISBN: 9788192666006
2	W M Morgan	Outline of Paint Technology (3rd Edition)	CBS Publishers & Distributors Pvt. Ltd, 2000 ISBN: 9788123904306
3	H F Payne	Organic Coating Technology vol-II	John Wiley & Sons Inc, 1961 ISBN: 9780471673538
4	V C Malshe and Meenal Sikchi	Basic of Paint Technology-I	V C Malshe and Meenal Sikchi Antar Prakash Centre for Yoga,2004 ISBN: 9788190329859
5	Dr. Swaraj Paul	Surface Coating Science and Technology	John Wiley & Sons Ltd, 2007 ISBN: 9788126552559
6	Oil and Colour Chemists Association of Australia (OCCA)	Surface Coatings, Vol-I Raw Materials and Their Usage	Chapman & Hall, 1993 ISBN: 9780412552106
7	John Stewart Remington	Pigments: Their Manufacture and Properties	L Hill Ltd
8	Arthur A. Tracton	COATINGS TECHNOLOGY HANDBOOK	Taylor & Francis Group; ISBN: 978-1-57444-649-4
9	Tipanna Mariyappa	Pigment Technology	Colour Publications Pvt Ltd
10	NIIR Board of Consultants and Engineers	Paints, Pigments, Varnishes & Enamels Technology Handbook (with Process & Formulations) 2nd Revised	Asia Pacific Business Press Inc.; ISBN: 9788178330372

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=Ww2QRpSG4fA	Introduction and history of pigments
2	https://www.youtube.com/watch?v=MikiTYpg2aQ	Ball milling method for pigment manufacturing
3	https://www.youtube.com/watch?v=lmZDtrwe_7o	China Clay (Kaolin) Separation from Silica Sand
4	https://www.youtube.com/watch?v=CtiKkJrB-ag	Elements of colour
5	https://www.youtube.com/watch?v=ph51qeXJknA	Ballmill grinding
6	https://www.youtube.com/watch?v=SQSkTVq4XvY	Introduction to pigment
7	https://www.youtube.com/watch?v=xvGH3wSbKKc	Applications of pigments
8	https://www.youtube.com/watch?v=DiXnBOA3Mag	Chemistry of dyes
9	https://www.youtube.com/watch?v=nRhKnsnPRew	Titanium dioxide manufacturing process
10	https://www.youtube.com/watch?v=CcNPE7rNKPo	Carbon black furnace method
11	https://www.youtube.com/watch?v=votX1QqWMh8	Oil absorption of pigments
12	https://www.youtube.com/watch?v=aZ5_cEjSOdo	Particle size analysis bu sieve method
13	https://www.youtube.com/watch?v=1B5R4ndvycQ	Working of automatic muller
14	https://www.youtube.com/watch?v=oEvjhAJFzYk	TESTING & EVALUATION (PIGMENTS):TINTING STRENGTH,REDUCING POWER,VOLATILE MATTER,BULK DENSITY

MSBTE - Final Copy Dt.09.08.2023 **1K**

RESIN TECHNOLOGY **Course Code : 321304**

Programme Name/s : Surface Coating Technology
Programme Code : SC
Semester : First
Course Title : RESIN TECHNOLOGY
Course Code : 321304

I. RATIONALE

The inclusion of a Resin Technology course in a Surface Coating Technology program is essential due to the critical role of resins in formulating and producing high-performance coatings. This course introduces resins as a vehicle, medium, binder, film forming material and as a polymer in surface coatings. It includes raw materials, basic chemistry, manufacturing processes, properties and applications of resins. The course explains the function of resins in a particular paints and thereby affecting the performance during paint application, post application, during life cycle of paint. This subject prepares students for careers in a rapidly evolving field while fostering a deep appreciation for the role of materials in modern society.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

The aim of this course is to help the student to attain the following industry identified outcomes through various teaching learning skill experiences: • Use appropriate resins for preparation of paints and coatings in industries.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Classify alkyd resin
- CO2 - Draw chemical structure of raw materials of polyester resin.
- CO3 - Describe properties of amino resins.
- CO4 - Explain types of phenolic resins.
- CO5 - Describe applications of natural resins.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
321304	RESIN TECHNOLOGY	RTE	DSC	3	-	3	2	8	4	3	30	70	100	40	25	10	50@	20	-	-	175

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 different raw materials for alkyd resins. TLO 1.2 Explain esterification reactions for of alkyd resins synthesis. TLO 1.3 State properties & applications of alkyd resins.	**Unit - I Alkyd Resin** 1.1 Introduction to alkyd resins. 1.2 Raw materials for alkyd resins. 1.3 Esterification reactions of alkyd. 1.4 Manufacturing methods of alkyd. 1.5 Properties & applications of alkyd.	Video Demonstrations Presentations Chalk-Board
2	TLO 2.1 Classify polyester resins. TLO 2.2 Draw chemical structures of raw materials used in polyester resins. TLO 2.3 State properties & applications of polyester resins.	**Unit - II Polyesters Resins** 2.1 Classification of polyester resins. 2.2 Raw materials for polyester resins. 2.3 Synthesis reactions of polyester. 2.4 Manufacturing methods for polyester resins. 2.5 Properties and application of polyester resin.	Video Demonstrations Chalk-Board Presentations
3	TLO 3.1 Classify amino resins. TLO 3.2 Describe synthesis methods of amino resin. TLO 3.3 State properties & applications of amino resins.	**Unit - III Amino resins** 3.1 Introduction to amino resins. 3.2 Raw materials for amino resins. 3.3 Chemistry of amino resins. 3.4 Properties and applications of amino resins. 3.5 Comparison of UF and MF resins.	Video Demonstrations Presentations Chalk-Board
4	TLO 4.1 List raw materials for phenolic resins. TLO 4.2 State properties & applications of phenolic resins. TLO 4.3 State significance of P: F ratio in synthesis of phenolic resins.	**Unit - IV Phenolic resins** 4.1 Types of phenolic resins. 4.2 Raw materials and reactions of phenolic resins. 4.3 P: F ratio and its significance. 4.4 Properties and application of Phenol Formaldehyde resins. 4.5 Modifications of phenolic resins.	Video Demonstrations Presentations Chalk-Board

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 State sources of natural resins. TLO 5.2 Explain properties and application of natural resins. TLO 5.3 Describe modifications of natural resins.	**Unit - V Natural resins** 5.1 Introduction to natural resins and their sources. 5.2 Types of natural resins (Rosin, Shellac, CNSL, Bitumen, CR, NC) 5.3 Modification methods of natural resins. 5.4 Properties and applications of natural resins.	Video Demonstrations Chalk-Board 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 Measure viscosity of alkyd resin.	1	Measure viscosity of alkyd resins using flow cup method	3	CO1
LLO 2.1 Determine acid value of alkyd resin.	2	Determine acid value of alkyd resin using KOH solution	3	CO1
LLO 3.1 Determine percentage non-volatile matter of Alkyd resins.	3	Determine percentage non-volatile matter of Alkyd resins.	3	CO1
LLO 4.1 Test the drying time of alkyd resin.	4	Test the drying time of alkyd resin.	3	CO1
LLO 5.1 Determine acid value of polyester resin.	5	Determine acid value of polyester resin using KOH solution.	3	CO2
LLO 6.1 Determine percentage non-volatile matter of polyester resins.	6	Determine percentage non-volatile matter of polyester resins.	3	CO2
LLO 7.1 Test acid, alkali resistance of polyester resin film.	7	Test acid, alkali resistance of polyester resin film.	3	CO2
LLO 8.1 Determine the Hydroxyl value of polyester resins.	8	Determine the Hydroxyl value of polyester resins.	3	CO2
LLO 9.1 Test the viscosity of amino resins.	9	Test the viscosity of amino resins using Gardner tube viscometer.	3	CO3
LLO 10.1 Find optimum baking schedule of alkyd-amino resins.	10	Find optimum baking schedule of alkyd-amino/polyester amino resins with varying ratios.	3	CO3
LLO 11.1 Test melting point of solid phenolic resin.	11	Test melting point of solid phenolic resin using ring and ball method.	3	CO4
LLO 12.1 Test melting point of solid phenolic resin.	12	Test melting point of solid phenolic resin using capillary method.	3	CO4
LLO 13.1 Determine compatibility of phenolic resin.	13	Determine compatibility of phenolic resin with drying and nondrying oils.	3	CO4
LLO 14.1 Find solubility of chlorinated rubber solution.	14	Find solubility of chlorinated rubber solution.	3	CO5
LLO 15.1 Test drying behavior of Nitrocellulose solution.	15	Test drying behavior of Nitrocellulose solution.	3	CO5
LLO 16.1 Determine compatibility of nitrocellulose solution.	16	Determine compatibility of nitrocellulose solution with various resins.	3	CO5
LLO 17.1 Determine percentage non volatile matter of amino resins	17	Determine percentage non volatile matter of amino resins	3	CO3
LLO 18.1 Determine softening point of cured Alkyd-amino film.	18	Determine softening point of cured Alkyd-amino film.	3	CO3
LLO 19.1 Determine acid value of rosin	19	Determine acid value of rosin	3	CO5

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 20.1 Determine compatibility of bitumen with solvents and oils	20	Determine compatibility of bitumen with solvents and oils	3	CO5

Note :
Students are expected to complete any 12 number of practical during the semester to attain desired psychomotor skill.

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

Micro project

- Correlate solubility data of various resins and solvents.
- Collect data of various modifications of resins with properties influenced due to modification.
- Prepare a simulated excel sheets for formulating principles for various synthetic resins.
- Collect MSDS of various reagents, chemicals and resins, used in laboratories to understand handling precautions.
- Make a visuals for crosslinking reaction behaviors of various resins systems.
- Prepare a data of various synthetic and natural resins with properties and application.
- Compare viscosities of resins using different viscometer at different temperature

Assignment

- Prepare a chart of classifications of resins.
- Write name of raw materials for resin synthesis with their structures.
- Enlist the properties and applications of resins.

Term Work

- Prepare journal for laboratory work

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Test tubes (15 ml capacity)	13,14,15
2	Measuring Cylinders (10 ml, 50ml 100ml)	2,5,7,8,13,14,16
3	Beakers (50, 100, 250 ml)	1,7,9,10,11,15,16
4	Burette (50ml, L.C.: 0.1 ml)	2,5,8
5	Conical Flasks (100 ml, 250 ml)	2,5,8
6	Volumetric flask (100, 250, 500 ml)	2,5,8
7	Ring and Ball Apparatus	11
8	Melting Point Apparatus	12
9	Capillaries	12
10	Thermometer (0-100 and 0-360OC)	1,12
11	Pipette (10 ml, 25 ml)	2,5,8
12	Glass rod (6 mm/10 mm)	1,6,7,10,13
13	Weighing Balance (Digital Display, 300 g, Sensitivity. 0.01 g)	All
14	Petri Dish (size-3”)	3,6
15	Ovens (Max temp-250oC)	3,6,10
16	Flow Cup B-4	1
17	Stop Watch (Analogue)	1,4,7,10
18	Spirit Level	1
19	Metal Panels (MS panel, 75*100*0.8mm)	4,7,10,15
20	Brush (Soft Brush, 1” rectangular)	4,7,10,15
21	Heating mantle	11

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
22	Gardner Tube Viscometer	9

IX. SUGGESTED FOR 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	Alkyd Resin	CO1	10	2	4	8	14
2	II	Polyesters Resins	CO2	10	2	4	8	14
3	III	Amino resins	CO3	10	2	4	8	14
4	IV	Phenolic resins	CO4	10	2	4	8	14
5	V	Natural resins	CO5	8	2	4	8	14
Grand Total				**48**	**10**	**20**	**40**	**70**

X. ASSESSMENT METHODOLOGIES/TOOLS

Formative assessment (Assessment for Learning)

- Mid term tests
- Assignment
- Terms work
- Seminar/Presentation/Demonstration

Summative Assessment (Assessment of Learning)

- Lab performance
- Viva-voce
- End of Term 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	-	-	2	1	2			
CO2	3	1	-	-	1	1	2			
CO3	3	2	1	-	1	1	2			
CO4	3	2	1	-	2	1	2			
CO5	3	2	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
1	W. M. Morgan	Outlines of Paint Technology (3rd Edition)	CBS Publishers & Distributors Pvt. Ltd, 2000 ISBN: 9788123904306

Sr.No	Author	Title	Publisher
2	Oil and Colour Chemists Association of Australia St (OCCA)	Surface Coatings, Vol I: Raw Materials and Their Usage	Chapman & Hall, 1993 ISBN: 9780412552106
3	H. F. Payne	Organic Coating Technology	John Wiley & Sons Inc (1961) ISBN: 9780471673538
4	V.C. Malshe and Meenal Sikchi	Basics of Paints Technology Part I	Antar Prakash Centre for Yoga, 2004 ISBN: 9788190329859
5	Dr. Swaraj Paul	Surface Coatings: Science & Technology (2nd Edition)	John Wiley and Sons Ltd.2014 ISBN:9788126552559
6	NIIR Board	Modern Technology of Paints, Varnishes & Lacquers (2nd Edition)	Asia Pacific Business Press Inc. 2007 ISBN: 8178330881

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/QHs8MMMNZ6c	Resins Types, Sources, Properties and Uses
2	https://youtu.be/dh-Rn0hkEto	ALKYD RESIN PROCESS AND PLANT MACHINERY
3	https://youtu.be/WI1pFqjG3_M	mixing machine for Resin production
4	https://youtu.be/q9eeeTKvyzQ	Solvents, Oils and Alkyds
5	https://youtu.be/1xM5wIPAGA0	Introduction to resins
6	https://youtu.be/2TxWXmEkz9E	Alkyd resin synthesis laboratory guide
7	https://youtu.be/PfkwcLadmQY	Manufacturing process of Saturated& Unsaturated polyester Resin
8	https://youtu.be/ta5dXfwNaDQ	Preparation of unsaturated polyester resin
9	https://youtu.be/7st_L5QkmtE	Unsaturated Polyester Resins
10	https://youtu.be/FDa0rXbQ6-U	Urea Formaldehyde Resin
11	https://youtu.be/IZZQ35cWHNw	Preparation of Urea Formaldehyde
12	https://youtu.be/wp9ZoAz3nS0	Preparation of Melamine Formaldehyde Polymer
13	https://youtu.be/VCCgFGmcRZk	Amino resins
14	https://www.youtube.com/live/1NbgBsWnI9s?feature=share	Phenol Formaldehyde Resin
15	https://youtu.be/Zb6bhgy8iJg	Preparation of Phenol formaldehyde resin
16	https://youtu.be/4UcxSEQbmqk	Phenol Formaldehyde Resins
17	https://youtu.be/zmJdFiajTM0	Phenolic Resin
18	https://youtu.be/VY715VXMWUc	Chlorinated rubber
19	https://youtu.be/7uXsxOIW_lc	Preparation of Nitrocellulose
20	https://youtu.be/C7FWPi4mJYo	NITROCELLULOSE BURN TEST

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 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/ 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/EP/ET/EX/FC/HA/HM/IC/IE/IF/IH/IS/IX/IZ/LE/ME/MK/M**

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

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 & TSL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
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
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.

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
LLO 4.1 Practice basic pranayama	4	Lab Exp: 8 Perform Bhastrika, Anulom Vilom Pranayam Kriya Lab Exp: 9 Practice Kapalbhati Pranayam Kriya Lab Exp:10 Practice Bhramary Pranayam.	5	CO3
LLO 5.1 Practice meditation	5	Lab Exp: 11 Perform sitting in Dhyan 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 :

Note:

1. Start and end of each session can be with appropriate Yoga prayers and chanting of Omkar.
2. Trainers can add similar asanas in practical sessions.
3. Students are to be instructed to practice the experiment performed at least twice a week as part of self learning practices.
4. Live demonstration by the trainer needs to be carried out during practical hours. Yogic Videos can be used as well .

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.

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 FOR WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table) : NOT APPLICABLE

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
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.swayam2.ac.in/aic19_ed28/preview- introduction to Yoga and Applications of Yog	Yoga and Applications of Yoga
2	https://onlinecourses.swayam2.ac.in/aic23_ge09/preview	Yoga for Creativity
3	https://onlinecourses.swayam2.ac.in/aic23_ge05/preview	Yoga for concentration
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