

Maharashtra State Board Of Technical Education, Mumbai																							
Learning and Assessment Scheme for Post S.S.C Diploma Courses																							
Programme Name						: Diploma In Mining & Mine Surveying / Mining Engineering																	
Programme Code						: MS / MZ										With Effect From Academic Year				: 2023-24			
Duration Of Programme						: 3 Year										Duration				: 32 WEEKS			
Year						: First				NCrF Entry Level : 3.0				Scheme				: K					
Sr No	Course Title	Abbreviation	Course Type	Course Code	Total IKS Hrs for Sem.	Learning Scheme					Credits	Assessment Scheme											
						Actual Contact Hrs./Week			Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week		Paper Duration (hrs.)	Theory			Based on LL & TL				Based on Self Learning	Total Marks		
						CL	TL	LL								Practical							
													FA-TH	SA-TH	Total	FA-PR	SA-PR	SLA					
																		Max	Max			Max	Min
(All Compulsory)																							
1	ELEMENTS OF MINING TECHNOLOGY	EMT	DSC	331301	-	3	-	2	1	6	6	03	30	70	100	40	50	20	25#	10	25	10	200
2	ELEMENTS OF MINING GEOLOGY	EMG	DSC	331302	1	3	-	2	1	6	6	03	30	70	100	40	50	20	25#	10	25	10	200
3	PHYSICS	APH	DSC	331303	1	2	-	2	1	5	5	1.5	30	70*#	100	40	50	20	50@	20	25	10	225
4	CHEMISTRY	ACH	DSC	331304	4	2	-	2	1	5	5	1.5	30	70*#	100	40	50	20	50@	20	25	10	225
5	MATHEMATICS	BMS	DSC	331305	6	2	1	-	-	3	3	03	30	70	100	40	-	-	-	-	-	-	100
6	COMMUNICATION SKILLS	CMS	AEC	331306	-	2	-	2	1	5	5	03	30	70	100	40	25	10	25@	10	25	10	175
7	SPORTS, YOGA AND MEDITATION	MEI	SEC	331001	1	-	-	1	1	2	2	-	-	-	-	50	20	-	-	25	10	75	
8	ENGINEERING GRAPHICS	EGR	DSC	331002	2	1	-	2	-	3	3	-	-	-	-	50	20	50@	20	-	-	100	
9	FUNDAMENTALS OF ICT	ICT	SEC	331003	-	1	-	2	-	3	3	-	-	-	-	50	20	50#	20	-	-	100	
10	WORKSHOP PRACTICES	WSP	SEC	331004	2	-	-	2	-	2	2	-	-	-	-	50	20	50@	20	-	-	100	
Total					17	16	1	17	6		40		180	420	600		425		325		150		1500

Sr No	Course Title	Abbreviation	Course Type	Course Code	Total IKS Hrs for Sem.	Actual Contact Hrs./Week			Learning Scheme		Credits	Paper Duration (hrs.)	Assessment Scheme										Total Marks
						CL	TL	LL	Self Learning (Activity/ Assignment /Micro Project)	Notional Learning Hrs /Week			Theory	Based on LL & TL		Based on Self Learning							
														Practical									
														FA-TH	SA-TH		Total	FA-PR	SA-PR	SLA			
														Max	Max		Max	Min	Max	Min	Max	Min	

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.* 30 Weeks

5. 1 credit is equivalent to 30 Notional hrs.

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

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

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

ELEMENTS OF MINING TECHNOLOGY**Course Code : 331301**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : ELEMENTS OF MINING TECHNOLOGY
Course Code : 331301

I. RATIONALE

Mining Engineering is the application of combined knowledge of various branches of engineering and technology in extracting the minerals from the earth and making it useful. The purpose of "Elements of Mining Technology" is to provide understanding of fundamentals of mining and its terminology so as to gain access to further knowledge and skills related to mining engineering and technology.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Implement relevant Mining operations safely and economically

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Identify the role and responsibility of different industry involved in exploration, exploitation, sa
- CO2 - Describe the terminologies in board and pillar and longwall mining.
- CO3 - Recognize terminology of underground metal mining.
- CO4 - Compare underground mining and surface mining.
- CO5 - Recognize terminology used in short firing, support and ventilation in underground coal mines.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks	
															Practical							
				CL	TL	LL	FA-TH	SA-TH			Total		FA-PR		SA-PR		SLA					
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min											
331301	ELEMENTS OF MINING TECHNOLOGY	EMT	DSC	3	-	2	1	6	6	03	30	70	100	40	50	20	25#	10	25	10	200	

Total IKS Hrs for Sem. : Hrs

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

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

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 30 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 use of given minerals in industry. TLO 1.2 Describe the role and functions of given organizations engaged in coal and non-coal mining. TLO 1.3 Identify the role of Education institutions in Mining industry	Unit - I Mining & Mineral 1.1 Historical Development in Mining Industry along with Ancient practices used in India , Uses of important minerals mined Coal, and lignite, iron ore, copper, zinc, gold, manganese Limestone, bauxite, mica etc. 1.2 Role of Mining Industry in Indian Economy ,Important Organizations involved in Mining like CIL, DGMS, IBM, CIMFR - Their role and functions. Long forms of SCCL,NLC, HCL,MOIL,HZL, BALCO,VEDANTA,BGML, MECL, GSI , CMPDI. 1.3 Important institutions imparting education on mining engineering ISM, IIT Kharagpur, VNIT, BHU,NIT SURTKAL,NIT ROURKELA	Model Demonstration Case Study Presentations
2	TLO 2.1 Describe given geological terms, used in underground Coal mining. TLO 2.2 Illustrate given modes of entries for underground Mining. TLO 2.3 Interpret different terms in board and pillar method. TLO 2.4 Illustrate different terms used in Longwall method.	Unit - II Underground coal mining 2.1 2.1 Geological Terms: • Bed, Bedding Plane, Bed Separation, • Formation of coal seam , • Dip of coal seam, strike of coal seam, • Thickness of coal seam, depth of coal seam. 2.2 2.2 Types of entries: Shaft, Incline, and Adit. 2.3 2.3 Bord and pillar method, • Definition of - Bord, Pillar, face, heading, Development, Depillaring. 2.4 2.4 Longwall Mining • Definitions of Main Gate, TailGate, Face length, barrier, longwall advancing, longwall retreating.	Model Demonstration Case Study Presentations

ELEMENTS OF MINING TECHNOLOGY**Course Code : 331301**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Describe given geological terms, used in underground Metal mining. TLO 3.2 Interpret given types of deposits of Metal and Non Metal.	Unit - III Underground metal mining 3.1 3.1 Geological terms: • Definitions of Rock, ore, minerals, Gangue, Host/Country Rock, Waste, Outcrop, Footwall, Hanging Wall. 3.2 3.2 Different types of deposits: Massive, Bedded or Tabular, Narrow Vein, Wide Vein, Lenticular or Pocket, Shoot, Placer, Outcrop, Float, Gossans.	Video Demonstrations
4	TLO 4.1 Describe the advantages and disadvantages of Surface Mining. TLO 4.2 Compare surface mining and underground mining	Unit - IV Surface Mining 4.1 Introduction of Surface Mining: • Surface mining • Advantages of surface mining. • Disadvantages of surface mining. 4.2 •Distinguish between surface & underground mining	Model Demonstration Case Study Presentations
5	TLO 5.1 Interpret the given terms in short firing. TLO 5.2 Identify given terms used in mine support. TLO 5.3 Illustrate given terms used in mine ventilation and environment.	Unit - V Underground mine development 5.1 5.1 Shot firing: Common terminologies in short firing Definition of Drilling, Charging, Exploder, Explosives, Detonator, Solid Blasting, powder factor and detonator factor. 5.2 5.2 Mine Support: Common terminologies used in mine support- prop support, cog support, Cross bar, roof bolt (definition and sketches only) 5.3 5.3 Mine Ventilation: Common terminologies used in mine ventilation and environment. Definition and sketch/ abbreviations / symbols of Intake, Return, Air Crossing, stopping, regulator, door	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 Select the website of mining organization	1	Use internet to find the Organizational structure of any company producing coal in India	2	CO1
LLO 2.1 Develop data collection skills, team working and presentation skills	2	Prepare Presentation on any company producing coal in India	2	CO1
LLO 3.1 Prepare the organizational structure of a metal producing company in India.	3	Use internet to find the Organizational structure of any company producing Metal in India	2	CO1
LLO 4.1 Develop data collection skills, team working and presentation skills.	4	Prepare Presentation on any company producing Metal in India.	2	CO1
LLO 5.1 Construct the organisational structure of an underground coal/ metal mine in India.	5	Draw a simple organisational structure of any underground coal/ metal mine in India.	2	CO1
LLO 6.1 Prepare the organisational structure of a surface coal/ metal mine in India.	6	Prepare a simple organisational structure of any surface coal/ metal mine in India.	2	CO1

ELEMENTS OF MINING TECHNOLOGY**Course Code : 331301**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 7.1 Prepare the Organizational structure of a Regulatory authority in Mining.	7	Use internet for finding the Organizational structure of any Regulatory authority in Mining.	2	CO1
LLO 8.1 Develop data collection skills, team working and presentation skills.	8	Prepare Presentation on any Regulatory authority in Mining.	2	CO1
LLO 9.1 Prepare the organisational structure of a research institute in mining.	9	Use internet to find the Organizational structure of any Research institute in Mining.	2	CO1
LLO 10.1 Develop data collection skills, team working and presentation skills.	10	Prepare Presentation on any Research institute in Mining.	2	CO1
LLO 11.1 Identify the geological features showing Bed, Bedding Plane, Bed Separation and Dip of coal seam, strike of coal seam.	11	Draw geological features showing Bed, Bedding Plane, Bed Separation and Dip of coal seam, strike of coal seam.	2	CO2
LLO 12.1 Identify the geological features showing Thickness of coal seam, depth of coal seam and plan, sectional view of fault plane.	12	Draw the geological features showing Thickness of coal seam, depth of coal seam and plan, sectional view of fault plane.	2	CO2
LLO 13.1 Determine the entries in underground mining showing Circular, Elliptical, Rectangular and Square shape shafts.	13	Draw entries in underground mining showing Circular, Elliptical, Rectangular and Square shape shafts.	2	CO2
LLO 14.1 Determine the rectangular and arch shapes of incline in underground mining.	14	Draw entries in underground mining showing rectangular and arch shape incline.	2	CO2
LLO 15.1 Determine the rectangular and arch shapes of adit in underground mining.	15	Draw entries in underground mining showing rectangular and arch shape adit.	2	CO2
LLO 16.1 Interpret the terminologies in Bord and Pillar development.	16	Draw a plan of Bord & Pillar development showing headings, face, barrier, bord and pillar.	2	CO2
LLO 17.1 Identify the width and height of gallery in coal mining.	17	Draw a cross section of gallery showing width of gallery, height of gallery.	2	CO2
LLO 18.1 Identify a coal pillar.	18	Sketch 3-D View of one coal pillar.	2	CO2
LLO 19.1 Interpret the terms in Longwall advancing layout.	19	Draw a Longwall Advancing working Layout showing Main Gate, Tail Gate and Barrier.	2	CO2
LLO 20.1 Interpret the terms in Longwall retreating layout.	20	Draw a Longwall Retreating working Layout showing Main Gate, Tail Gate and Barrier.	2	CO2
LLO 21.1 Recognize the various types of deposits in metal mines.	21	Draw Massive, Bedded or Tabular, Narrow Vein, Wide Vein, Lenticular or Pocket, Shoot, Placer, and Outcrop deposits in Metal Mines.	2	CO3
LLO 22.1 Recognize a layout of an opencast mine.	22	Draw a simple layout of an opencast mine.	2	CO4

ELEMENTS OF MINING TECHNOLOGY**Course Code : 331301**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 23.1 Identify prop support and cog support in underground mining.	23	Draw a Plan and Section showing the details of, Erecting of prop support at the face and incline Road Ways and Settings of cog support at junctions.	2	CO5
LLO 24.1 Identify cross bar support and roof bolt in underground mining.	24	Draw a Plan and Section showing the details of, Setting of Cross Bar in the gallery and setting of roof bolt any one type.	2	CO5
LLO 25.1 Interpret the abbreviations of Intake, Return, Air Crossing, stopping, regulator and door, as per CMR 2017.	25	Draw the abbreviations used in CMR 2017 showing Intake, Return, Air Crossing, stopping, regulator and door.	2	CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Assignment

- Give a seminar on the uses of various minerals.
- Collect data regarding various minerals mined in your state with locations and companies engaged in their mining.
- Prepare a chart to classify Mining Organizations.

Micro project

- Prepare a report on industrial visit.
- Develop models on various types of deposits in metal mine.

Term Work

- Prepare journal and portfolio of practicals.

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

ELEMENTS OF MINING TECHNOLOGY**Course Code : 331301**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Laser Printer	1,2,3,4,5,6,7,8,9,10
2	Well equipped computer centre with broadband connection, required softwares, microsoft office suite and AutoCAD.	1,2,3,4,5,6,7,8,9,10
3	Models of different geological features showing Bed, Bedding Plane, Bed Separation and Dip of coal seam, strike of coal seam.	11
4	Drawing tools and equipments	11,12,13,14,15,16,17,18,19,20,21,22,23,24,25
5	Chart and layout showing Thickness of coal seam, depth of coal seam.	12
6	Models of various types of entries in underground mining-Incline, Shaft & Adit.	13,14,15
7	Model of Bord & Pillar development.	16
8	Charts and models of a) Cross section of gallery showing width and height of gallery b) 3-D view of one coal pillar.	17,18
9	Model of Longwall layouts a) Longwall Advancing, b) Longwall retreating	19,20
10	Charts and models of various types of deposits in metal mines.	21
11	Model of Opencast mining.	22
12	Model of prop support & cog support.	23
13	Specimen of roof bolt. Model of cross bar support and roof bolt.	24
14	Chart showing various ventilation devices.	25

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Mining & Mineral	CO1	21	2	6	8	16
2	II	Underground coal mining	CO2	21	2	6	8	16
3	III	Underground metal mining	CO3	15	2	4	6	12
4	IV	Surface Mining	CO4	12	2	2	4	8
5	V	Underground mine development	CO5	21	4	6	8	18
Grand Total				90	12	24	34	70

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

- Mid term tests
- Rubrics for COs
- Assignment, Self-learning and Term work
- Seminar/ Presentation

Summative Assessment (Assessment of Learning)

- Lab. performance

ELEMENTS OF MINING TECHNOLOGY**Course Code : 331301**

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

Legends :- High:03, Medium:02,Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Deshmukh, D. J.	Elements of Mining Technology	Denett, Central Techno Publications, Nagpur
2	G. B. Mishra	Winning & Working	Lovely Prakashan, Dhanbad
3	S. K. Das	Surface Mining Technology	Lovely Prakashan, Dhanbad
4	Kaku, L.S.	Mining Digest	Lovely Prakashan, Dhanbad
5	R. D. Singh	Principles & Practices of Modern Coal Mining	New Age International (P) Limited, Publishers, New Delhi ISBN: 81-224-0974-1

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://youtu.be/haibcPlbAK4	Key learning
2	www.discoveryforengineers.com	Learning
3	https://www.dgms.gov.in/	Key Learning
4	https://ibm.gov.in/IBMPortal/	Key Learning
5	https://www.coalindia.in/	Learning
6	https://youtu.be/umywCfTukIY	Key learning

Note :

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

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : ELEMENTS OF MINING GEOLOGY
Course Code : 331302

I. RATIONALE

The student of first year of Mining and Mine surveying must know basics of Geology. The knowledge of Origin of Earth, Mineralogy, and Petrology, Structural Geology including Coal Geology is included in this course. This course will help the students to identify different types of rocks, minerals and nature of strata,. The student can also identify geological features like fault and fold and prepare the geological maps of the area. This geological information will help Mining Engineer to choose appropriate method of working. The course will also provide useful information for the ground control in underground mines and slope stability in opencast mines

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: a. Implement geological knowledge in mining operations. b. Prepare structural map.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Elaborate different aspects of the earth with its origin ,interior, forces acting on it.
- CO2 - Analyze physical and chemical properties of minerals.
- CO3 - Interpret Physical Geology by natural process and earthquake , volcano.
- CO4 - Identify various types of rocks with its characteristics.
- CO5 - Interpret different geological Structures and understanding of geological maps.
- CO6 - Describe physical and chemical properties of coal with its type.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH	Paper Duration		Theory				Based on LL & TL				Based on SL		Total Marks	
															Practical							
				CL	TL	LL	FA-TH	SA-TH			Total		FA-PR		SA-PR		SLA					
													Max	Min	Max	Min	Max	Min	Max	Min		
331302	ELEMENTS OF MINING GEOLOGY	EMG	DSC	3	-	2	1	6		6	03	30	70	100	40	50	20	25#	10	25		10

ELEMENTS OF MINING GEOLOGY**Course Code : 331302****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.* 30 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 given branches of Geology TLO 1.2 Illustrate given theories of origin and age of earth. TLO 1.3 Explain various layers of Interior of earth TLO 1.4 Explain specified tectonic forces acting on earth. TLO 1.5 Describe Plate Tectonics	Unit - I GENERAL GEOLOGY 1.1 Branches, sub branches, allied branches of geology and scope of geology. 1.2 Origin of earth, Age of earth 1.3 Interior of earth 1.4 Continental Drift 1.5 Plate margin, types of plate margin	Demonstration , Seminar , Case Study
2	TLO 2.1 Describe given type of minerals TLO 2.2 Identify given properties of specified minerals	Unit - II MINERALOGY 2.1 Introduction to minerals 2.2 Definition and classification of mineral. 2.3 Physical and chemical properties of minerals	Demonstration, Identification
3	TLO 3.1 Discuss given erosion and weathering process TLO 3.2 Identify the problems related with Earthquakes. TLO 3.3 Identify the problems related with volcanoes	Unit - III PHYSICAL GEOLOGY 3.1 Definition and types of erosion and weathering. 3.2 Terminology used in Earthquake. 3.3 Classification, Intensity scale, origin, effects of Earthquake. 3.4 Earthquake Resistant structures, Earthquake zones. 3.5 Volcano and its Terminologies. 3.6 Classification and product of volcano. 3.7 Volcanic structures & distribution of volcano.	Demonstration, Seminar Case ,Study

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

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 List various characteristics of rock types. TLO 4.2 State different types of rocks. TLO 4.3 Describe classification of given rock. TLO 4.4 Illustrate structures of specified rocks.	Unit - IV PETROLOGY 4.1 Rock cycle and characteristics of various rock types . 4.2 Igneous rock – origin and classification, structures, occurrence and uses. 4.3 Sedimentary rock– origin and classification, structures and occurrence and uses. 4.4 Metamorphic rock– origin and classification, structures, occurrence and uses.	Demonstration Identification Seminar Case Study
5	TLO 5.1 Define strike and dip. TLO 5.2 Recognize given type of folds, faults and unconformity in the field. TLO 5.3 Identify given joints and cleavages. TLO 5.4 Describe given characteristics of contour lines. TLO 5.5 Interpret given topography on the basis of contour lines.	Unit - V STRUCTURAL GEOLOGY 5.1 Strike and dip, apparent dip, True dip. 5.2 Classification of folds and its recognition in field, Classification of faults and its recognition in field, Classification and recognition of unconformity in the fields. 5.3 Joints and cleavages. 5.4 Characteristics of contour lines.	Demonstration, Seminar, Case Study ,Project
6	TLO 6.1 Enlist different types of coal. TLO 6.2 Identify the given properties of coal. TLO 6.3 Explain structures of specified coal seam. TLO 6.4 Describe given ranks of coal.	Unit - VI COAL GEOLOGY 6.1 Classification of coal, Origin, occurrence and distribution of coal seam. 6.2 Physical and chemical properties of various types of coal. 6.3 Rank of coal, Banded constituents of Coal.	Demonstration Seminar Case Study Project

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify various layers of Interior of Earth.	1	Draw the internal structure of Earth.	2	CO1
LLO 2.1 Understand the physical properties of minerals.	2	Identify color of given set of minerals.	2	CO2
LLO 3.1 Illustrate the physical properties of minerals.	3	Identify streak of minerals.	2	CO2
LLO 4.1 Interpret the physical properties of minerals.	4	Identify crystalline and non-crystalline forms of given set of minerals.	2	CO2
LLO 5.1 Determine the hardness of minerals.	5	Calculate Mohs scale of hardness of given specimen.	2	CO2

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 6.1 Illustrate the physical properties of minerals.	6	Identify lustre of metallic and nonmetallic minerals.	2	CO2
LLO 7.1 Determine the physical properties of minerals.	7	Identify various types of cleavages.	2	CO2
LLO 8.1 Understand physical properties of minerals. LLO 8.2 Understand the physical properties of minerals.	8	Identify various types of fractures.	2	CO2
LLO 9.1 Understand physical properties of minerals.	9	Identify physical properties of Quartz group minerals- Rock crystal, Amethyst, smoky, milky, rosy quartz, agate.	2	CO2
LLO 10.1 Understand the physical properties of minerals.	10	Identify physical properties of Feldspar group and Amphibole group minerals. Amphibole group: Hornblende, Actinolite, Tremolite. Feldspar Group: Orthoclase, Microcline, Albite, and Plagioclase.	2	CO2
LLO 11.1 Determine the physical properties of minerals.	11	Identify physical properties of Pyroxene group: Hypersthene, Enstatite, Augite, and Diopside. Mica group: Muscovite, Biotite, and Phlogopite.	2	CO2
LLO 12.1 Interpret the physical properties of minerals.	12	Identify physical properties of Miscellaneous Silicates Group minerals- Olivine, Garnet, chlorite, Clay, Talc, Kyanite.	2	CO2
LLO 13.1 Determine the physical properties of minerals.	13	Identify physical properties of Non Silicate Group minerals- Calcite, Dolomite, Gypsum, Fluorite, Apatite, Graphite, Corundum and Baryte.	2	CO2
LLO 14.1 Understand earthquake intensity scale and types of eruptions.	14	Draw earthquake intensity scales and types of volcanic eruptions.	2	CO3
LLO 15.1 Identification of Igneous Rocks.	15	Identify physical properties of Igneous rocks-Granite, Basalt, Rhyolite, Pegmatite, Gabbro.	2	CO4
LLO 16.1 Identification of Sedimentary Rocks.	16	Identify physical properties of sedimentary rocks- Sand Stone, Breccia, Conglomerate, Shale, Limestone, Coal, Chalk, Marl, Dolomite Laterite, and Quartzite.	2	CO4
LLO 17.1 Identification of Metamorphic Rocks.	17	Identify physical properties of metamorphic rocks- Schist, Gneiss, Slate, Marble, Amphibolite.	2	CO4
LLO 18.1 Determine dip and strike of outcrop.	18	Calculate dip and strike of rock beds.	2	CO5
LLO 19.1 Interpret the profile by contour map.	19	Draw topography on the basis of contour map.	2	CO5
LLO 20.1 Understand the horizontal bedding.	20	Draw a geological section of horizontal beds.	2	CO5

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 21.1 Understand symmetrical anticlinal and synclinal folds.	21	Draw a geological section of symmetrical anticlinal and synclinal folds.	2	CO5
LLO 22.1 Calculation of strike and dip in faulted area. LLO 22.2 Acquire knowledge of geological structures by mapping.	22	Draw geological section of beds having normal fault by calculating strike and dip from contour line.	2	CO5
LLO 23.1 Calculation of strike and dip in faulted area. LLO 23.2 Acquire knowledge of geological structures by mapping.	23	Draw geological section of beds having reverse fault calculating strike and dip from contour line.	2	CO5
LLO 24.1 Calculation of strike and dip in faulted area. LLO 24.2 Acquire knowledge of geological structures by mapping.	24	Draw geological section of beds having vertical fault calculating strike and dip from contour line.	2	CO5
LLO 25.1 Calculation of strike and dip in faulted area. LLO 25.2 Acquire knowledge of geological structures by mapping.	25	Draw geological section of beds having inclined fault by calculating strike and dip from contour line.	2	CO5
LLO 26.1 Acquire knowledge of geological structures by mapping.	26	Draw geological section of beds having unconformity.	2	CO5
LLO 27.1 Acquire knowledge of geological structures by mapping.	27	Draw geological section of beds having double vertical fault.	2	CO5
LLO 28.1 Categorize the types coal.	28	Identify types of coal on the basis of various properties.	2	CO6
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Assignment

- Prepare a chart on Moh's scale of hardness.
- Prepare chart showing our solar system.

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

- Prepare a report on field visit.

Micro project

- Collect photographs and samples of minerals by visiting camp and prepare report.
- Collect different types of rocks in your vicinity.
- Prepare wooden models of fold, fault and unconformity.

Term Work

- Prepare journal of practicals.
- Group discussion on geological topics such as plate tectonics, earthquakes, volcanoes, etc.
- Prepare presentation on relevant topics.

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Chart showing interior of Earth.	1
2	Wooden model of earth.	1
3	Chart of volcano and earthquake zone of India.	14
4	Hand specimen of Igneous, Sedimentary and Metamorphic rocks.	15,16,17
5	Brunton compass.	18
6	Contour maps, Topographic maps, Structural maps, drawing instruments.	19,20,21,22,23,24,25,26,27
7	Kit of various color of minerals.	2
8	Hand specimen of various types of coal.	28
9	Kit of Streak of minerals (magnifying lense, penknife and streak plates).	3
10	Kit of Forms of minerals (magnifying lense, penknife).	4
11	Kit of Moh's scale of hardness of minerals.	5
12	Kit of of lustres of minerals (magnifying lense, penknife and streak 6 plates).	6
13	Kit of fractures set (magnifying lense, penknife and streak plates).	7
14	Kit of cleavage set (magnifying lense, penknife and streak plates).	8
15	Hand specimens of 30 silicate and 15 non silicate group.	9,10,11,12,13

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
-------	------	------------	-------------	----------------	---------	---------	---------	-------------

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	GENERAL GEOLOGY	CO1	16	2	4	6	12
2	II	MINERALOGY	CO2	12	2	2	6	10
3	III	PHYSICAL GEOLOGY	CO3	12	2	2	6	10
4	IV	PETROLOGY	CO4	18	4	4	6	14
5	V	STRUCTURAL GEOLOGY	CO5	20	4	4	6	14
6	VI	COAL GEOLOGY	CO6	12	2	2	6	10
Grand Total				90	16	18	36	70

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

- Mid Term Tests
- Rubrics for COs
- Assignment, Self-learning and Term Work
- Seminar/ Presentation

Summative Assessment (Assessment of Learning)

- Lab performance
- End of Term Examination
- 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	3						3			
CO2	3	3		3		3	3			
CO3	3	3		3			3			
CO4	3	3		3		3	3			
CO5	3	3	2	3	2	3	3			
CO6	3	3	2	3	2	3	3			
Legends :- High:03, Medium:02,Low:01, No Mapping: -										
*PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
-------	--------	-------	----------------------------

ELEMENTS OF MINING GEOLOGY**Course Code : 331302**

Sr.No	Author	Title	Publisher with ISBN Number
1	BANGAR K.M.	PRINCIPLES OF ENGINEERING GEOLOGY	Standard Publishers Distributors Delhi 2013 ISBN 13 978-8180141157
2	Parbin Singh	Engineering and General Geology	S.K. Kataria and Sons.
3	Dr.R.K. BOPACHE & Dr.D.K.AGRAWAL	GENERAL AND ENGINEERING GEOLOGY	GLOBAL EDUCATION
4	A. parthasarathy, V. Panchapakesan, R. Nagarjun	Engineering Geology	Wiley Publishing, New Delhi, 2003 ISBN : 978-8126509461
5	R.N.P Arogyaswamy	Courses in Mining Geology	CBS Publisher, ISBN 13-978-8120409378
6	G. B. Mahapatra	A Textbook of Physical Geology	CBS Publishers & Distributors, ISBN 10-8123901100

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.gsi.gov.in/webcenter/portal/OCBIS	It has reports, maps, manuals and Guidelines. Training programmes for learning.
2	https://pubs.geoscienceworld.org/	a free, public map-based toolset that allows users to search for cross sections, charts, tables, fig
3	www.geologyshop.com	printed products including maps, sheet explanations and regional guides.
4	www.geology.com	This web site has information and News about Geology and Earth Science.
5	https://www.surveyofindia.gov.in/	It is a official website of Survey of India having information about maps, mines and geological info
6	www.discovery.com	This is good for enhancing knowledge by watching few relevant programmes on Mines and Mine Survey an
7	https://youtube.com/@ExploringGeologybyGeolovers	This video is good on Exploring Geology in Hindi and information about Jobs in India.

Note :

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

PHYSICS**Course Code : 331303**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : PHYSICS
Course Code : 331303

I. RATIONALE

Mining Diploma engineers have to deal with various materials and machines related to mining process . This course is designed to help the mining diploma engineers to apply the basic concepts and principles of physics to solve broad-based engineering problems. The basic concepts and principles of physics related to heat, electricity, magnetism, optics, elasticity, viscosity, surface tension, motion, thermo couples and semiconductors will help in understanding the technical courses where emphasis is on the applications of these concepts and principle in different technology applications. Also the principles of modern physics like LASERs, optical fiber X-Rays and photo-sensors will help the students to select and use relevant methods which will be economical and eco-friendly.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: Solve broad-based Mining engineering problems applying principles of physics.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Use basic instruments to measure the physical quantities in various engineering situations.
- CO2 - Apply law of linear, circular, projectile motion in various mechanics related engineering application.
- CO3 - Apply the basic principles of thermometry and fiber optics to solve engineering problems.
- CO4 - Select relevant material in industry by analyzing its physical properties.
- CO5 - Apply the basic principles of electromagnetics to solve given engineering problems.
- CO6 - Use LASERs, X-Rays and photo electric sensors in Mining engineering related applications.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs./Week			SLH	NLH			Theory	Based on LL & TL				Based on SL					
												Practical									
				CL	TL	LL						FA-TH	SA-TH	Total	FA-PR		SA-PR		SLA		
							Max	Min			Max				Min	Max	Min	Max	Min		
331303	PHYSICS	APH	DSC	2	-	2	1	5	5	1.5	30	70*#	100	40	50	20	50@	20	25	10	225

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.* 30 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 physical quantities and its types with examples. TLO 1.2 Differentiate between scalar and vector quantities with examples TLO 1.3 Apply dimensional analysis to check correctness of given equation and conversion of given units in different systems TLO 1.4 Estimate the errors in the measurement for the given problem TLO 1.5 Explain the working of ancient astronomical instruments to measure distance , time and hour angle . TLO 1.6 Explain the procedure of measuring the dimension of a given object from Vernier calipers and screw gauge	Unit - I Units and Measurements 1.1 Unit, physical quantities: fundamental and derived quantities and their units Systems of units: CGS, MKS and SI 1.2 Scalar and Vector Physical Quantities 1.3 Dimensions, dimensional formula , Applications of dimensional analysis; correctness of physical equations ,conversion factor for interconversion of units in different systems of units 1.4 Errors, types of errors: instrumental, systematic and random error. 1.5 Estimation of errors : absolute, relative and percentage error, significant figures. 1.6 Ancient astronomical instruments: Chakra, Dhanur yatra , Yasti and Phalaka yantra 1.7 Vernier calipers , Screw gauge	Improved lecture Demonstration Video Demonstrations

PHYSICS

Course Code : 331303

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Explain the equations of motion for the given body moving in the given type of path. TLO 2.2 Calculate the angular velocity of the given body. TLO 2.3 Explain the relevant Newton's laws of motion for the given moving object. TLO 2.4 Calculate the work/power/ energy for the given situation. TLO 2.5 Calculate the given parameters for the given projectile in motion.	Unit - II Types of Motion 2.1 Displacement, velocity, acceleration and retardation, equations of motion, equations of motion under gravity. 2.2 Angular displacement, angular velocity, angular acceleration, three equations of angular motion. 2.3 Momentum, impulse, impulsive force, Newton's laws of motion and their Applications 2.4 Work, power and energy: potential energy, kinetic energy, work –energy principle. 2.5 Projectile motion, trajectory, angle of projection, time of flight and range of projectile with formulae.	Improved lecture Demonstration Flipped Classroom
3	TLO 3.1 Convert temperature in different temperature scales. TLO 3.2 Differentiate between different modes of heat transfer with example TLO 3.3 Inter-relate the characteristics of the three gas laws. TLO 3.4 Apply Newton's law of cooling to determine the rate of heat loss in given situation. TLO 3.5 Explain total internal reflection in optical fiber. TLO 3.6 Differentiate between types optical fiber with applications .	Unit - III Thermometry and Basics Fiber Optics 3.1 Heat, temperature, temperature scales 3.2 Modes of transfer of heat: Conduction , Convection and Radiation , Applications in daily life 3.3 Boyle's law, Charle's law, Gay Lussac's law, perfect gas equation 3.4 Law of thermal conductivity, Newton's law of cooling 3.5 Laws of refraction, total internal reflection 3.6 Optical fiber: Principle, construction and working Types of Optical fibers; Single mode step index, Multimode step index, Multimode graded index Applications of optical fibers	Improved lecture Demonstration Flipped Classroom

PHYSICS

Course Code : 331303

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 Apply the concept of elasticity and plasticity to select the material for Engineering application TLO 4.2 Establish relation between given types of moduli of elasticity. TLO 4.3 Predict the behavior of the given metallic wire. TLO 4.4 Explain pressure-depth relation for the given law. TLO 4.5 Apply Newton's law to to find viscosity of the given liquid. TLO 4.6 Explain Stokes' law for the free fall of the body through the given viscous medium TLO 4.7 Describe the salient features of the given NDT method.	Unit - IV Properties of matter and Non-Destructive Testing 4.1 Deforming Force and Restoring Force, Elasticity, Plasticity, Rigidity. 4.2 Stress and Strain and their types, elastic limit and Hooke's law, types of moduli of elasticity. 4.3 Stress -Strain diagram, poisson's ratio, factors affecting elasticity. 4.4 Fluid friction, pressure, pressure- depth relation, Pascal's law, Archimedes' principle. 4.5 Viscosity, velocity gradient, Newton's law of viscosity. 4.6 Free fall of spherical body through viscous medium and Stokes' law, derivation of coefficient of viscosity '?' by Stokes' method, effect of temperature and adulteration on viscosity of liquids. 4.7 Non-destructive testing (NDT), Various NDT methods used, Criteria for the selection of NDT method, merits and demerits of NDT.	Improved lecture Demonstration Flipped Classroom
5	TLO 5.1 Explain electric field, potential and potential difference. TLO 5.2 Explain magnetic intensity and flux with their units. TLO 5.3 Apply laws of series and parallel combination to the given electrical circuits. TLO 5.4 Explain the heating effect of electric current TLO 5.5 Distinguish between conductors, semiconductors and insulators on the basis of energy bands. TLO 5.6 Explain the I-V characteristics and applications of given p-n junction diode.	Unit - V Electricity, Magnetism and Semiconductors. 5.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference 5.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux 5.3 Electric current, Ohm's law, specific resistance, laws of series and parallel combination of resistance. Conversion of galvanometer into ammeter and voltmeter, Heating effecting of electric current 5.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, minority and majority charge carriers 5.5 p-n junction diode, Depletion layer I-V characteristics of p-n junction,	Improved lecture Demonstration Video Demonstrations

PHYSICS**Course Code : 331303**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
6	TLO 6.1 Explain plank Hypothesis given for the explanation of nature of radiation TLO 6.2 Explain the working of the given photoelectric device. TLO 6.3 Explain the production of X-Rays of the given material with properties and applications. TLO 6.4 Differentiate between LASER and ordinary light source TLO 6.5 Explain the given terms related to LASER	Unit - VI Photoelectricity, X- Rays and LASERs 6.1 Planck's hypothesis, properties of photons 6.2 Photo electric effect: threshold frequency, threshold wavelength, stopping potential, Work function, characteristics of photoelectric effect, Einstein's photoelectric equation 6.3 Photoelectric cell and LDR : Principal ,Working and applications. 6.4 Production of X-rays by modern Coolidge tube, properties and applications. 6.5 Laser: properties, absorption, spontaneous and stimulated emission, applications of Laser 6.6 Population inversion, active medium, optical pumping, three energy level system, He-Ne Laser.	Improved lecture Demonstration Flipped Classroom

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Use vernier caliper to measure dimensions of given objects.	1	Dimension measurements by vernier Calliper	2	CO1
LLO 2.1 Use vernier caliper to measure the dimensions of objects of known dimensions and Use vernier caliper to estimate the errors in measurement.	2	Estimation of error in measurement using vernier caliper	2	CO1
LLO 3.1 Use Screw gauge to measure dimensions of given objects.	3	Determination of dimension of object by micrometer Screw gauge	2	CO1
LLO 4.1 Use Screw gauge to measure the dimensions of objects of known dimensions LLO 4.2 Use Screw gauge to estimate the errors in measurement.	4	Estimation of error in measurement using micrometer screw gauge	2	CO1
LLO 5.1 Use Spherometer to measure radius of curvature of any curved Surface.	5	Determination of radius using spherometer	2	CO1
LLO 6.1 Find the downward force, along an inclined plane, acting on a roller due to gravity and its relationship with the angle of inclination.	6	Determination of downward force along an Inclined plane	2	CO2
LLO 7.1 Predict the range of the projectile from the initial launch speed and angle.	7	Determination of range projectile motion	2	CO2
LLO 8.1 Determine the pressure-volume relation using Boyle's law.	8	Determination of P-V relation by Boyle's law.	2	CO3
LLO 9.1 Use Joule's calorimeter to determine Joule's mechanical equivalent of heat.	9	Determination of Joule's mechanical equivalent of heat.	2	CO3
LLO 10.1 Use Searle's thermal conductivity apparatus to find coefficient of thermal conductivity of a given material.	10	Determination of Thermal conductivity of material by Searle's method (virtual lab)	2	CO3
LLO 11.1 Use pin method to determine refractive index of prism.	11	Determination of refractive index of prism.	2	CO3

PHYSICS**Course Code : 331303**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 12.1 Determine the refractive index of glass slab using TIR phenomenon.	12	Determination of Total Internal Reflection of given glass slab	2	CO3
LLO 13.1 Use Searle's method to determine the Young's modulus of given wire	13	Determination of Young's modulus of wire	2	CO4
LLO 14.1 Use Archimedes' principle to determine the buoyancy force on a solid immersed in liquid.	14	Determine the buoyancy force using Archimedes' principle	2	CO4
LLO 15.1 Find relation between terminal velocity and radius of spherical body with different materials passing through the liquid.	15	Determination of Relation between terminal velocity and radius of spherical body	2	CO4
LLO 16.1 Determine the coefficient of viscosity of given liquid by Stoke's method.	16	Determination of the coefficient of viscosity of given liquid by Stoke's method.	2	CO4
LLO 17.1 Use Ohm's law to solve circuit problems.	17	Measurement of circuit parameters using ohm's law	2	CO5
LLO 18.1 Determine the specific resistance of given wire.	18	Measurement of specific resistance of wire	2	CO5
LLO 19.1 Use the principle of series resistance in solving engineering problems.	19	Measurement of resistance using Law of resistance in series .	2	CO5
LLO 20.1 Use the principle of parallel resistance in solving engineering problems.	20	Measurement of resistance using Law of resistance in parallel .	2	CO5
LLO 21.1 Use magnetic compass to draw the magnetic lines of forces of magnet of different shapes.	21	Draw Magnetic lines of forces for various shapes of magnet	2	CO5
LLO 22.1 Use magnetic compass to determine the neutral points when North pole of bar magnets points towards the north pole of earth.	22	Determination of neutral point due to north pole	2	CO5
LLO 23.1 Use p-n junction diode to draw forward bias and reverse bias .	23	Determination of I-V characteristics. of p-n junction diode	2	CO5
LLO 24.1 Determine forbidden energy band gap in semiconductors.	24	Determination of Forbidden energy band gap semiconductor (virtual lab)	2	CO5
LLO 25.1 Find the dependence of the stopping potential on the frequency of light source in photo electric effect experiment.	25	Determine dependency of stopping potential on frequency using photo electric effect	2	CO6
LLO 26.1 Find the dependence of the stopping potential on the intensity of light source in photo electric effect experiment.	26	Determine the relation between stopping potential and Intensity of photon using Photo electric effect	2	CO6
LLO 27.1 Determine the I-V characteristics of photoelectric cell .	27	Determination of I-V characteristics of photoelectric cell	2	CO6
LLO 28.1 Determine the I-V characteristics of LDR.	28	Determination of I-V characteristics of LDR	2	CO6
LLO 29.1 Determine the divergence of laser beam.	29	Determination of divergence of laser beam	2	CO6

PHYSICS**Course Code : 331303**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
Note : Out of above suggestive LLOs - '*' Marked Practicals (LLOs) Are mandatory. - Minimum 80% of above list of lab experiment are to be performed. - Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Assignment

- 1) Convert the units of a given physical quantity from one system of units to another.
- 2) Measure room temperature of hot baths / bodies by using mercury thermometer and convert it into different temperature scales (lab- based).
- 3) Prepare a chart to summarize units and measurements
- 4) Enlist information like band gap, material used, dimension etc. about different semiconductor devices such as LED, PNP / NPN transistors, SCR etc.
- 5) Give details about the explanation of concept like electrostatics, magnetic domain, current electricity types of magnets etc . given in reference books (library based)
- 6) Demonstrate the variation of angle of refraction with respect to refractive index using online tools such as PhET (online assignment)
- 7) Use a digital Vernier caliper and micrometer screw gauge for measurements.(lab- based).
- 8) Applications of optical fibers in civil, mechanical , electrical engineering etc.
- 9) Applications of semiconductors in mining , civil, mechanical , electrical engineering etc.
- 10) Enlist different types of lasers and their uses in various fields
- Enlist different types of applications of photocell and x-ray in industries

Micro project

- a Vernier Calipers: Prepare prototype vernier caliper of desired least count using card sheet
- b Conductivity: Collect different materials such as metal, plastics, glass etc. and prepare models to differentiate between good and bad conductors within collected materials.
- c. Gas laws: Prepare models to demonstrate Boyle's laws, Charle's Law and Gay Lussac's law using household materials.
- d. Series and parallel resistances: Prepare models for combination of series and parallel resistances using bulbs/ LED.
- e Magnetic flux: Prepare models to demonstrate magnetic lines of lines of forces of different types of magnets.
- f. Carbon resistors: Determine the resistance and tolerance of carbon resistors using color codes and multimeters.
- g. Thermal conductivity: Take different metallic plates of various metals and calculate rate of flow of heat
- h. Temperature sensor : Use Temperature sensor IC LM 35 to measure temperature of given body in various temperature scales.
- j. Optical Fiber and TIR: Prepare model to demonstrate total internal reflection and the propagation of light in optical fiber
- i. Mobile applications : Use mobile applications for measurements of different physical quantities For Eg. intensity of light of given light source (LED, Bulb)
- K. LDR: Use Light dependent resistor for measuring the intensity of light.
- L Gas laws: Prepare models to demonstrate Boyle's laws, Charles's Law and Gay Lussac's law using household materials.
- m Elasticity: Prepare a working model to demonstrate the stress–strain behavior of different wires of different thickness and material..

PHYSICS**Course Code : 331303**

- n Viscosity: Collect 3 to 5 liquids and prepare a working model to differentiate liquids on the basis of viscosity and demonstrate their applications.
- o Motion: Prepare model of ball rolling down on inclined plane to demonstrate the conservation of energy and motion of an object in inclined plane.
- p Photo Sensors: Prepare simple photo sensor using LDR.
- q Properties of Laser: Use Key chain laser to differentiate laser with ordinary light.

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Vernier Calipers: Range : 0-150mm , Resolution: 0.1mm	1
2	Searle's thermal conductivity apparatus : Cylindrical copper, aluminum, brass, glass and iron rod, steam chamber, digital / analogue thermometer, arrangement for fitting tubes and thermometer	10
3	Magnetic compass, bar magnets	11,12
4	Searle's apparatus(with slotted mass of 0.5 kg each)	13
5	Liquid container, measuring cylinder ,spring balance , weights	14
6	Stoke's apparatus (glass jar , viscous liquid, spherical balls of various sizes	15,16
7	Stop watch digital or manual having L.C 0.1 sec	15,16
8	Digital multimeter : 3 1/2 digit display, 9999 counts, digital multimeter measures: Vac, Vdc (1000V max) , Adc, Aac (10 amp max), Hz , Resistance (0 - 100 M?)	17,18,19,20
9	Resistance Box: 4 decade ranges from 1 ohm to 1K ohm ,accuracy 0.1 % - 1 %	17,18,19,20
10	Micrometer screw gauge : Range : 0-25mm, Resolution: 0.01mm, Accuracy ± 0.02 mm or better	2
11	Glass slab, equilateral glass prism	21,22
12	Forbidden energy band gap set up, Oven : temperature range up to 1000C, thermometer, micro ammeter, Ge, Si diode	24
13	photo electric effect kit ,optical bench , Source of light	25,26
14	Experimental setup for characteristics of photoelectric cell, optical bench ,source of light	25,26
15	Experimental setup for characteristics of LDR,optical bench .source of light etc	27,28
16	Laser Source (He Ne, diode laser) ,He Ne laser of wavelength 632.8 nm , optical bench , graph paper etc	29
17	Solid body ball bearings of different radius and different materials	6,15,16
18	Projectile motion apparatus wooden block 190 x 58 x 30 mm approx. with a pivoted L-section spring loaded metal launching bar with a trigger catch.	7

PHYSICS**Course Code : 331303**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
19	Boyle's apparatus: U tube manometer , barometer	8
20	Joule's calorimeter : well insulated "mechanical equivalent of heat apparatus" in wooden box, , digital / analog thermometer,	9
21	Battery eliminator : 0- 12 V ,2A	9,17,18,19,20

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Units and Measurements	CO1	7	4	2	3	9
2	II	Types of Motion	CO1,CO2	9	4	2	4	10
3	III	Thermometry and Basics Fiber Optics	CO3	10	2	4	6	12
4	IV	Properties of matter and Non-Destructive Testing	CO1,CO4	12	3	5	6	14
5	V	Electricity, Magnetism and Semiconductors.	CO1,CO5	13	4	4	6	14
6	VI	Photoelectricity, X- Rays and LASERs	CO1,CO6	9	3	4	4	11
Grand Total				60	20	21	29	70

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

- mid term
- Mid term tests
- Assignments
- Self learning
- Term work

Summative Assessment (Assessment of Learning)

- 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	1			

PHYSICS**Course Code : 331303**

CO2	3	1	1	2	1	1	1			
CO3	3	1	1	2	1	1	1			
CO4	3	1	1	1	1	1	1			
CO5	3	1	1	1	1	1	1			
CO6	3	1	1	2	1	1	1			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Narlikar, J. V. ;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part I - Class XI	National Council of Education Research and Training, New Delhi, 2010, ISBN : 8174505083
2	Narlikar, J.V.;Joshi , A. W.; Mathur , Anuradha ; et al	Physics Textbook Part II - Class XI	National Council of Education Research and Training, New Delhi, 2015, ISBN : 8174505660
3	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part I - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506314
4	Narlikar, J.V.;Joshi , A. W.; Ghatak A.K. et al	Physics Textbook Part II - Class XII	National Council of Education Research and Training, New Delhi, 2013, ISBN : 8174506713
5	Haliday, David; Resnik, Robert and Walker, Jearl	Fundamentals of Physics	John Wiley & sons, Hoboken, USA, 2014 ISBN : 812650823X
6	Dr. Mina Talati & Vinod Kumar Yadav	Applied Physics-I	Khanna Book Publishing (2021) ISBN : 978-93-91505-43-1
7	Dr. Hussain Jeevakhan	Applied Physics-II	Khanna Book Publishing (2021) ISBN: 978-93-91505-57-8
8	Steeramula Rajeswara Sarma	The Archaic And The Exotic : Studies In The History Of Indian Astronomical Instruments	Published by Manohar Book Service, 2008 ISBN 10: 8173045712 / ISBN 13: 9788173045714
9	Aryabhatta	The surysidhant	baptist mission press calcutta

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.physicsclassroom.com	concepts of basic physics
2	www.physics.org	concepts of basic physics
3	https://phet.colorado.edu	Electricity,magnetism,semiconductor,basics of optical fiber
4	http://nptel.ac.in/course.php?disciplineId=115	concepts of Basic and applied physics
5	http://nptel.ac.in/course.php?disciplineId=104	concepts of Basic and applied physics
6	https://www.youtube.com/results?search_query=amruta+university+physics+expts	virtual lab simulation
7	https://www.youtube.com/results?search_query=physics+class+1+chapter+1	concepts of Basic and applied physics
8	https://iksindia.org	IKS philosophy about measurements

PHYSICS**Course Code : 331303**

Sr.No	Link / Portal	Description
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

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

CHEMISTRY**Course Code : 331304**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : CHEMISTRY
Course Code : 331304

I. RATIONALE

Diploma engineers have to deal with various materials and machines. This course is designed with some fundamental information to help the technologists to apply the basic concepts and principles of chemistry to solve broad-based engineering problems. The study of basic principles of chemistry and the concepts related to various materials such as metals, alloys, inorganic salts, polymers, lubricants, paints, varnishes, adhesives and others will help in understanding the technology courses where emphasis is on the applications of these in different technology applications. As well as the study of metals, alloys, cement, lime, refractory materials water treatment and analysis, fuel and combustion will help the students to select and use relevant methods which will be economical and eco-friendly.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

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

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Predict the structure, properties and behaviour of molecules and compounds based on the types of chemical bond.
- CO2 - Apply the concepts of electrochemistry and corrosion preventive measures in industry.
- CO3 - Use the appropriate engineering material and catalyst appropriately.
- CO4 - Apply the relevant metallurgical process related to industrial applications.
- CO5 - Use relevant water treatment process to solve industrial problems.
- CO6 - Use relevant fuel in relevant applications.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												Total Marks	
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL				
															Practical								
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA				
							Max	Min		Max					Min	Max	Min	Max	Min				
331304	CHEMISTRY	ACH	DSC	2	-	2	1	5	5	1.5	30	70*#	100	40	50	20	50@	20	25	10	225		

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.* 30 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 properties of given material based on the bond formation. TLO 1.2 Describe the molecular structure of given solid, liquid and gases. TLO 1.3 Describe the crystal structure of the given solids. TLO 1.4 Explain Properties of metallic solid.	Unit - I Chemical bonding 1.1 Indian chemistry: Philosophy of atom by Acharya Kanad. 1.2 Electronic theory of valency: Assumptions , Chemical bonds: Types and characteristics of electrovalent bond, covalent bond, coordinate bond, hydrogen bond, metallic bond and Intermolecular forces of attraction. 1.3 Molecular arrangement in solid, liquid and gases 1.4 Structure of solids: crystalline and amorphous solids , Properties of metallic solid, Unit cell: simple cubic, body center cubic (BCC) , face centre cubic (FCC), hexagonal close pack crystals.	Chalk-Board Presentations, simulation Video Demonstrations Model Demonstration

CHEMISTRY

Course Code : 331304

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Describe mechanism of electrolysis of CuSO₄ solution by using Cu and Pt electrodes. TLO 2.2 Solve numerical based on Faraday's first and second law of electrolysis. TLO 2.3 Distinguish between primary and secondary cell. TLO 2.4 Describe the phenomenon of the given type of corrosion and its prevention. TLO 2.5 Identify the different factors affecting rate of corrosion for the given type of material. TLO 2.6 Select the protective measures to prevent the corrosion in the given corrosive medium.	Unit - II Electrochemistry and Metal Corrosion, its prevention 2.1 Electrolyte, types of electrolytes, ionization and dissociation, electrode potential oxidation and reduction potential, Electrolysis, electrochemical series for cations and anions. Mechanism of electrolysis of CuSO₄ solution by using platinum electrodes. 2.2 Faraday's laws of electrolysis: Faraday's first and second law, relation between electrochemical equivalent and chemical equivalent, Numerical. Application of electrolysis: electro-refining of copper and electroplating 2.3 Difference between primary and secondary cell 2.4 Corrosion: Definition and Types of corrosion Dry corrosion, mechanism, Types of oxide films, Wet corrosion, mechanism due to hydrogen evolution in acidic medium And oxygen absorption mechanism in neutral or alkaline medium, Galvanic cell action by Daniel 2.5 Factors affecting the rate of corrosion 2.6 Corrosion control: Modification of environment, Use of protective coatings, Tinning, Galvanizing, anodic and cathodic protection, choice of material using pure metal and using metal alloys.	Chalk-Board Presentations Case Study Video Demonstrations

CHEMISTRY

Course Code : 331304

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Identify the ingredients of the given paints. TLO 3.2 List out salient properties of the given paint and varnish. TLO 3.3 Describe the properties of insulating materials for the given application. TLO 3.4 Differentiate the given types of structural polymers. TLO 3.5 Describe the polymerization process of the given polymer. TLO 3.6 Explain the properties and uses of the given polymer, elastomer and adhesive. TLO 3.7 Describe the application of relevant adhesives required for the given material. TLO 3.8 Suggest the lubricant for various types of machines in industry. TLO 3.9 Select the relevant catalyst for given application. TLO 3.10 Select the relevant catalyst for given application.	Unit - III Engineering Materials and Catalysis 3.1 Paints: Purposes of applying paint, Characteristics of paints, Ingredients of paints, function and examples of each ingredient. 3.2 Varnish: Types, difference between paints and varnishes. 3.3 Insulators: Characteristics, classification, properties and application of glass wool, thermocole 3.4 Polymer and Monomer: Classification on the basis of molecular structure, monomers (homo polymer and copolymer) and thermal behavior (Thermoplastics and Thermosetting) 3.5 Types of polymerization reaction, addition polymerization, condensation polymerization, synthesis, properties and application of polyethylene, polyvinyl chloride, Teflon. polystyrene, phenol formaldehyde, epoxy Resin 3.6 Adhesives: Characteristics, classification and their uses 3.7 Lubricants: Classification, properties and applications. 3.8 Catalysis: Types of catalysis homocatalysis ,heterocatalysis . 3.9 Catalyst: Types of Catalyst Positive, Negative and Auto-catalyst, Catalytic Promoter and Catalytic inhibitor, Industrial application of catalyst.	Chalk-Board Presentations Flipped Classroom Demonstration Flipped Classroom

CHEMISTRY

Course Code : 331304

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 Describe construction and working of the given type of furnace. TLO 4.2 Describe the extraction process of the given ore with chemical reaction. TLO 4.3 Select the relevant alloy for the given application stating the properties with justification TLO 4.4 Describe the constituents, hardening and setting process of the given type of cement. TLO 4.5 Select the relevant refractory for given application stating the properties with justification.	Unit - IV Metals, alloys, Cement, and Refractory Materials 4.1 Ancient Indian Metallurgy, Occurrence of metals, definitions of mineral, ore, flux, matrix, slag ,Flow chart showing different processes in metallurgy. 4.2 Types of furnace: Muffle furnace, Blast furnace 4.3 Extraction processes of Hematite, copper pyrite ores. (crushing, concentration, reduction, refining.) 4.4 Properties of iron and copper: Hardness, tensile strength, toughness, malleability, ductility, refractoriness, fatigue resistance. specific gravity, specific heat, brazing, castability, stiffness. 4.5 Preparation of alloys (Fusion and compression method). 4.6 Ferrous alloys: Composition ,properties and applications of low carbon, medium carbon, high carbon steels 4.7 Non-ferrous alloy: Composition ,properties and applications of Brass, Bronze, Duralumin, Tinman Solder, Woods metal 4.8 Cement: Types; Bio cement and Portland cement; constituents, setting and hardening, applications. 4.9 Lime: classification, constituents, setting and hardening, applications. Refractory material: Types, properties.	Chalk-Board Presentations Demonstration Site/Industry Visit
5	TLO 5.1 Describe the given terminologies related to hard water and their effects. TLO 5.2 Describe the given process for softening of the given water sample. TLO 5.3 Describe with sketches the purification of the given type of water. TLO 5.4 Describe the given type of waste water treatment.	Unit - V Water treatment 5.1 Hardness of water :Causes and types of hardness. 5.2 Hard water in boilers and prevention: Boiler corrosion, caustic embrittlement, priming and foaming, scales and sludges. 5.3 Water softening: lime soda process (hot lime soda and cold lime soda process), zeolite process, ion exchange process (cation exchange and anion exchange).PH scale. Numerical on PH and POH 5.4 Potable water treatment: Sedimentation, coagulation, filtration and sterilization 5.5 Waste water treatment: sewage treatment, BOD and COD of sewage water; Reverse Osmosis, recycling of waste water	Chalk-Board Presentations Case Study Site/Industry Visit

CHEMISTRY

Course Code : 331304

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
6	TLO 6.1 Describe salient properties of the given type of fuel. TLO 6.2 Explain the given type of analysis of the given type of coal. TLO 6.3 Calculate the calorific value of the given solid fuel using Bomb calorimeter. TLO 6.4 Describe composition, properties of given gaseous fuel with their applications. TLO 6.5 Calculate the mass and volume of air required for complete combustion of the given fuel.	Unit - VI Fuels and Combustion 6.1 Fuel: Classification, characteristics of good fuel. 6.2 Solid fuels: Coal, Classification and composition, proximate analysis, Ultimate analysis, Bomb calorimeter. Carbonization of coke by Otto Hofmann's oven. 6.3 Liquid fuels: Fractional distillation of crude petroleum, boiling range, composition, properties. Knocking, cracking, octane number and cetane number. 6.4 Gaseous fuels: Biogas, LPG, and CNG. Combustion equation of gaseous fuels, mass and volume of air required for complete combustion.	Chalk-Board Presentations Demonstration 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 Identify cation in given ionic solutions by performing selective test	1	Identification of cation in given ionic solutions.	2	CO1
LLO 2.1 Identify of anion in given ionic solutions by performing selective test.	2	Identification of anion in given ionic solutions.	2	CO1
LLO 3.1 1 Identify states of matter of materials by using simulation. by Applying heating and cooling Techniques. LLO 3.2 Relate temperature-pressure diagram	3	Identification of states of matter.	2	CO1
LLO 4.1 Determine electrode potential of copper metal. by setting electrochemical cell. LLO 4.2 Measure electrode potential of Cu Using Voltmeter LLO 4.3 Measure the cell potential for various conditions	4	Determination of the electrode potential of copper metal.	2	CO2

CHEMISTRY**Course Code : 331304**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 5.1 Determine the electrode potential of Iron metal. by setting electrochemical cell LLO 5.2 Measure electrode potential of Fe Using Voltmeter. LLO 5.3 Measure the cell potential for various conditions.	5	Determination of electrode potential of Iron metal.	2	CO2
LLO 6.1 Determine the electrode potential of Al metal. by setting electrochemical cell LLO 6.2 Measure electrode potential of Al Using Voltmeter. LLO 6.3 Measure the cell potential for various conditions.	6	Determination of electrode potential of Al metal	2	CO2
LLO 7.1 Determine the voltage generated from chemical reaction using Daniel Cell. LLO 7.2 Set up Daniel Cell. Prepare Electrolyte Solution LLO 7.3 Measure voltage accurately	7	Determination of voltage generated from chemical reaction using Daniel Cell.	2	CO2
LLO 8.1 Prepare Electrolyte Solution of CuSO ₄ of known concentration. LLO 8.2 Set up electrolysis apparatus. LLO 8.3 Control various parameters of electrolysis. LLO 8.4 Determine electrochemical equivalent of Cu metal using Faraday's first law.	8	Determination of electrochemical equivalent of Cu metal using Faraday's first law.	2	CO2
LLO 9.1 Prepare Electrolyte Solution of the given metal of known concentration. LLO 9.2 Set up electrolysis apparatus. LLO 9.3 Control various parameters of electrolysis. LLO 9.4 Analyze the data obtained from the experiment. LLO 9.5 Verify Faraday second law.	9	Determination of equivalent weight of metal using Faraday's second law.	2	CO2
LLO 10.1 Prepare corrosive solutions. LLO 10.2 Determine the extent of corrosion.	10	Preparation of corrosive medium for Aluminium at different temperature.	2	CO3

CHEMISTRY**Course Code : 331304**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 11.1 Prepare corrosive solutions. LLO 11.2 Determine the extent of corrosion. LLO 11.3 Compare the corrosion behavior of Aluminum at different temperatures.	11	Determination of rate of corrosion at different temperatures for Aluminium.	2	CO3
LLO 12.1 Set up redwood viscometer LLO 12.2 Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer LLO 12.3 Compare viscosity.	12	Determination of effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I	2	CO3
LLO 13.1 Determine the steam emulsification number of given lubricating oil. LLO 13.2 Measure the steam flow duration.	13	Determination of the steam emulsification number of given lubricating oil.	2	CO3
LLO 14.1 Calculate the flash and fire point of given lubricating oils using Cleveland open cup apparatus.	14	Determination of flash and fire point of given lubricating oils using Cleveland open cup apparatus.	2	CO3
LLO 15.1 Determine the flash point of given lubricating oil using Abel's closed cup apparatus.	15	Determination of flash point of given lubricating oil using Abel's closed cup apparatus.	2	CO3
LLO 16.1 Determine thinner content in oil paint. using electric oven.	16	Determination of thinner content in oil paint.	2	CO3
LLO 17.1 Addition of chemicals and preparation of reaction medium. LLO 17.2 Follow Safety precautions.	17	Preparation of phenol formaldehyde resin used in manufacturing of Bakelite.	2	CO3
LLO 18.1 Addition of chemicals and preparation of reaction medium. LLO 18.2 Follow Safety precautions,	18	Preparation of urea formaldehyde resin used in manufacturing of Sunmica.	2	CO3
LLO 19.1 Prepare hematite ore sample. LLO 19.2 Standardization of KMnO ₄ solution. LLO 19.3 Calculate percentage of iron in hematite ore by titration method	19	Preparation of Standardized KMnO ₄ solution using standard oxalic acid Determine the percentage of iron present in given Hematite ore by KMnO ₄ solution.	2	CO4

CHEMISTRY**Course Code : 331304**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 20.1 Prepare Cu ore sample. LLO 20.2 Calculate percentage of Cu .	20	Determination of the percentage of copper in given copper ore.	2	CO4
LLO 21.1 Prepare alloy sample. LLO 21.2 Determine percentage of iron in steel alloy.	21	Determination of the percentage of iron in the given steel alloy sample using redox titration.	2	CO4
LLO 22.1 Prepare cement sample. LLO 22.2 Calculate the percentage of calcium content.	22	Determination of percentage of calcium content in given cement sample.	2	CO4
LLO 23.1 Prepare EDTA solution of known concentration. LLO 23.2 Determine total hardness of water by titration.	23	Determination of total hardness, temporary hardness and permanent hardness of water sample by EDTA method.	2	CO5
LLO 24.1 Prepare AgNO ₃ Solution of known concentration. LLO 24.2 Calculate chloride content in water sample.	24	Determination of chloride content in given sample of water by Mohr's method.	2	CO5
LLO 25.1 Use Nephelometer. LLO 25.2 Calculate turbidity of water sample.	25	Determination of turbidity of given water sample by Nephelometric method.	2	CO5
LLO 26.1 Use universal indicator for PH values. LLO 26.2 Calculate PH value by using PH meter.	26	Determination of PH value on given Solution using PH meter and universal indicator.	2	CO5
LLO 27.1 Prepare acid solution of known concentration. LLO 27.2 Determine alkalinity of water sample.	27	Determination of the alkalinity of given water sample.	2	CO5
LLO 28.1 Set up Bomb Calorimeter. LLO 28.2 Calculate calorific value.	28	Determination of calorific value of given solid fuel using Bomb calorimeter	2	CO6
LLO 29.1 Use of oven for appropriate temperature settings. LLO 29.2 Calculate moisture and ash content in coal sample.	29	Determination of moisture and ash content in given coal sample using proximate analysis.	2	CO6
LLO 30.1 Use gravimetric analysis method LLO 30.2 calculate the percentage of sulphur.	30	Determination of percentage of Sulphur in given coal sample by ultimate analysis. (Gravimetric analysis)	2	CO6
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Assignment

- Describe the constituents, hardening and setting process of the given type of cement.
- Solve numerical based on Faraday's first and second law of electrolysis.
- Enlist various Adhesives with properties and applications.
- Compare between Thermoplastics and Thermosetting.
- Explain covalent bond, ionic bond, coordinate bond, hydrogen bond, intermolecular forces
- Draw Crystal structures of SC,BCC, FCC,HCP.
- Distinguish between paints and varnishes.
- State properties and applications thermocol and glass wool
- Differentiate the given types of structural polymers and list out their applications.
- Demonstrate Mechanism of wet corrosion by waterline corrosion.
- Describe zeolite and lime soda process .
- Prepare chart showing mechanism of electrolysis of CuSO_4 solution by using Cu and Pt electrodes.
- Write properties and applications of solid, semisolid and liquid lubricant.
- List and describe steps involved in metallurgical processes.
- Compare solid liquid and gaseous fuel.

Micro project

- Types of bonds: Prepare chart and models displaying different types of bonds with examples.
- Prepare a chart for showing different types of bonds or molecules.
- Crystal Structure: Prepare Models of SC,FCC,HCP,BCC
- Ionization: Prepare chart displaying ionization phenomenon.
- Corrosion-Prepare Chart displaying images of observed corrosion processes in the surrounding.
- Adhesives: Prepare chart or model to demonstrate the applications of various adhesives.
- Polymer: Collect the samples of different polymers and list their uses.
- Collect information based on market survey of different Polymer and compare the following points. i) Structure ii) Properties.
- Collect information by library survey regarding engineering material used in various industries.
- Metal properties: Prepare chart showing different industrial application of metal and relate it with required property or properties using internet.
- Alloy steel: Find the effect of alloying elements like Mn, Cr, Ni, W, V, Co on properties of steel.
- Prepare chart of showing percentage composition, properties and industrial applications of different types of steel based on above alloying elements using internet
- Water analysis: Collect water samples from different water sources and find the characteristics like acidity, conductivity, dissolved solids, suspended particles.
- Water analysis: Prepare model to find the soap foaming capacity of bore water on addition of soda ash
- Water treatment: Collect 3 to 5 water samples to find the dosage of bleaching powder required for its sterilization.
- Fuels: Prepare chart showing different types of liquid fuels showing their calorific values and uses.

CHEMISTRY**Course Code : 331304****Note :**

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Redwood viscometer-1	12
2	Cleveland open cup apparatus	14
3	Abel's closed cup apparatus.	15
4	Nephelometer ; Auto-ranging from 20-200 NTU,+/- 2% of reading plus 0.1 NTU, power 220 Volts +/- 10% AC 50 Hz	25
5	pH meter reading up to pH14; ambient temp. -40 to 700 C.; pH/mV resolution:13 bit	26
6	Bomb calorimeter	28
7	Electric oven inner size 18"x18"x18"; temperature range 100 to 2500 C. with the capacity of 40 lt.	29
8	Muffle furnace, Temperature up to 9000C,digital temperature controller with an accuracy of +/- 30C	29
9	Ammeter 0-2 amp voltmeter-0-5v DC	4,7,8,9,5,6
10	Electronic balance, with the scale range of 0.001g to 500gm pan size 100 mm; response time 3-5 sec.: power requirement 90-250 V, 10 watt.	All

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Chemical bonding	CO1	6	2	3	4	9
2	II	Electrochemistry and Metal Corrosion, its prevention	CO2	12	3	4	5	12
3	III	Engineering Materials and Catalysis	CO3	12	3	5	6	14
4	IV	Metals, alloys, Cement, and Refractory Materials	CO4	10	2	4	6	12
5	V	Water treatment	CO5	10	2	3	6	11
6	VI	Fuels and Combustion	CO6	10	3	4	5	12
Grand Total				60	15	23	32	70

X. ASSESSMENT METHODOLOGIES/TOOLS**Formative assessment (Assessment for Learning)****MSBTE Approval Dt. 01/10/2024****Semester - 1, K Scheme**

CHEMISTRY**Course Code : 331304**

- For classroom learning 30 Marks (two tests). For laboratory learning 50 Marks.

Summative Assessment (Assessment of Learning)

- For classroom learning End semester assessment of 70 marks For laboratory learning 50 Marks

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	2	1		1		2			
CO2	3	2	1		1		2			
CO3	3	2	1	1	1		2			
CO4	3	2	1		1		2			
CO5	3	2	1		1		2			
CO6	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 with ISBN Number
1	Jain and Jain	Engineering Chemistry	Dhanpat Rai and sons; New Delhi, 2015, ISBN : 9352160002
2	Dara, S. S.	Engineering Chemistry	S. Chand Publication, New Delhi, 2013, ISBN: 8121997658
3	Bagotsky,V.S.	Fundamental of Electrochemistry	Wiley International N. J.,2005, ISBN: 9780471700586
4	Agarwal, Shikha	Engineering Chemistry	Cambridge university press ; New Delhi, 2015 ISBN : 9781107476417
5	Vairam, S.	Engineering Chemistry	Wiley India Pvt. Ltd. New Delhi, 2013, ISBN: 9788126543342
6	Agnihotri Rajesh	Chemistry for Engineers	Wiley India Pvt. Ltd. New Delhi, 2014, ISBN: 9788126550784
7	Anju Rawlley,Devdatta V. Saraf	Applied Chemistry with Lab Manual	Khanna Book Publishing Co. (P) Ltd. New Delhi, 2021, ISBN- 978-93-91505-44-8

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.britannica.com/science/chemical-bonding	Basic concepts in chemistry

CHEMISTRY**Course Code : 331304**

Sr.No	Link / Portal	Description
2	https://www.ancient-origins.net/history-famous-people/indian-sage-achary	IKS Philosophy of atom by Acharya Kanad.
3	https://vedicheritage.gov.in/vedic-heritage-in-present-context/metallurgy/	IKS (Indian metallurgy)
4	www.chem1.com	Chemistry instructions and concepts
5	https://phet.colorado.edu/en/simulations/category/chemistry/general	Virtual lab ,Simulation
6	https://chemcollective.org/	virtual lab, simulation
7	www.rsc.org	Catalysis
8	https://iksindia.org/	IKS
9	ww.onlinelibrary.wiley.com	Materials and corrosion
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

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

MATHEMATICS**Course Code : 331305**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : MATHEMATICS
Course Code : 331305

I. RATIONALE

Mathematics plays a crucial role in diploma programs as it fosters the development of critical thinking skills, enhances quantitative literacy, prepares students for higher education, promotes problem-solving abilities, cultivates logical and abstract thinking, and fosters mathematical literacy. By engaging with Mathematics, students acquire logical reasoning, problem-solving techniques and analytical thinking, which are valuable for lifelong learning and professional growth. Mainly geometry, trigonometry, and basic math are generally required for mining engineering. Calculus is a branch of Mathematics that calculates how matter, particles, and heavenly bodies actually move. Derivatives are useful to find maxima and minima of the function, and velocity and acceleration are also useful for many engineering optimization problems. Statistics can be defined as a type of mathematical analysis involving collecting and analyzing data and then summing up the data into a numerical form for a given set of factual data or real-world observations. It equips individuals with the ability to interpret numerical information, make informed decisions and navigate real-world situations. Moreover, Mathematics provides a foundation for further studies in various disciplines and prepares students to tackle complex challenges. By exploring abstract concepts and logical structures, students develop their ability to reason, make connections, and approach problems with clarity and precision. Furthermore, studying Mathematics helps students appreciate the historical and cultural significance of Mathematics and its applications in diverse fields, thereby fostering mathematical literacy and a deeper understanding of the world. Hence the course provides the insight to analyze engineering problems scientifically using logarithms, matrices, trigonometry, straight line, differential calculus, and statistics. By incorporating these topics, students comprehend an approach oriented toward the application of Math in Mining and Mining surveying applications.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Apply the concept of Mathematics to solve mining and mines related technology-based problems.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Apply the concepts of algebra to solve problems related to mines and mine surveying.
- CO2 - Utilize trigonometry to solve problems related to mines and mine surveying.
- CO3 - Solve problems related to mines and mine surveying under given conditions of straight lines.
- CO4 - Apply differential calculus to solve problems related to mines and mine surveying.
- CO5 - Use techniques and methods of statistics to crack problems related to mines and mine surveying.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH		SA-TH		Total		FA-PR		SA-PR		
							Max	Min			Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	
331305	MATHEMATICS	BMS	DSC	2	1	-	-	3	3		03	30	70	100	40	-	-	-	-	-	

Total IKS Hrs for Sem. : 6 Hrs

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
1	TLO 1.1 Solve the given simple problem based on laws of logarithm. TLO 1.2 Solve given system of linear equations using matrix inversion method. TLO 1.3 Obtain the proper and improper partial fraction for the given simple rational function. TLO 1.4 Solve simultaneous equations by using concept given in Ancient Indian Mathematics.	Unit - I Algebra 1.1 Logarithm: Concept and laws of logarithm. 1.2 Matrices: Matrices, algebra of matrices, transpose, value of determinant of matrix of order 3x3, adjoint and inverse of matrices. 1.3 Matrices: Solution of simultaneous equations by matrix inversion method. 1.4 Partial Fractions: Types of partial fraction based on nature of factors and related Problems. 1.5 Algebra in Indian Knowledge System: Solution of simultaneous equations (Indian Mathematics).	Improved Lecture Tutorial Assignment Demonstration Simulation

MATHEMATICS**Course Code : 331305**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Apply the concept of Compound angle, allied angle and multiple angles to solve the given simple engineering problem(s). TLO 2.2 Apply the concept of Sub-multiple angle to solve the given simple engineering related problem(s). TLO 2.3 Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). TLO 2.4 Investigate given simple problems by utilizing inverse trigonometric ratios. TLO 2.5 Use concept given in Ancient Indian Mathematics for trigonometry to solve given problems.	Unit - II Trigonometry 2.1 Trigonometric ratios of allied angles, compound angles, multiple angles (2A, 3A), submultiples angles. (without proof) 2.2 Factorization and De factorization formulae. (without proof). 2.3 Inverse Trigonometric Ratios and related problems. 2.4 Principle values and relation between trigonometric and inverse trigonometric ratios. 2.5 Trigonometry in Indian Knowledge System: The Evolution of Sine Function in India. 2.6 Indian Trigonometry: Basic Indian Trigonometry- Introduction and Terminology (From Ancient Beginnings to Nilakantha). 2.7 Trigonometry in Indian Knowledge System: Pythagorean triples in Sulabasutras.	Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach
3	TLO 3.1 Calculate angle between given two straight lines. TLO 3.2 Formulate equation of straight lines related to given engineering problems. TLO 3.3 Identify perpendicular distance from the given point to the line. TLO 3.4 Calculate perpendicular distance between the given two parallel lines. TLO 3.5 Use geometry given in Sulabasutras to solve the given problems.	Unit - III Straight Line 3.1 Straight line and slope of straight line: Angle between two lines, Condition of parallel and perpendicular lines. 3.2 Various forms of straight lines: Slope point form, two-point form, Double intercept form, General form. 3.3 Perpendicular distance from a point on the line. 3.4 Perpendicular distance between two parallel lines. 3.5 Geometry in Sulabasutras in Indian Knowledge System (construction of square, circling the square). (Indian Mathematics).	Improved Lecture Tutorial Assignment Demonstration Simulation

MATHEMATICS**Course Code : 331305**

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 Solve the given simple problems based on functions. TLO 4.2 Solve the given simple problems based on rules of differentiation. TLO 4.3 Obtain the derivatives of composite, implicit, parametric, inverse, logarithmic, exponential functions. TLO 4.4 Apply the concept of differentiation to find given equation of tangent and normal. TLO 4.5 Apply the concept of differentiation to calculate maxima, minima and radius of curvature for given function. TLO 4.6 Familiar with concept of calculus given in Indian Mathematics.	Unit - IV Differential Calculus 4.1 Functions and Limits: Concept of function and simple examples. 4.2 Functions and Limits: Concept of limits without examples. 4.3 Derivatives: Rules of derivatives such as sum, Product, Quotient of functions. 4.4 Derivatives: Derivative of composite functions (chain Rule), implicit and parametric functions. 4.5 Derivatives: Derivatives of inverse, logarithmic and exponential functions. 4.6 Applications of derivative: Second order derivative without examples, Equation of tangent and normal, Maxima and minima, Radius of curvature. 4.7 Calculus in Indian Knowledge System: The Discovery of Calculus by Indian Astronomers.(Indian Mathematics).	Improved Lecture Tutorial Assignment Demonstration Simulation
5	TLO 5.1 Obtain the range and coefficient of range of the given grouped and ungrouped data. TLO 5.2 Calculate mean and standard deviation of ungrouped and grouped data related to the given simple engineering problem(s) TLO 5.3 Determine the variance and coefficient of variance of given grouped and ungrouped data. TLO 5.4 Justify the consistency of given simple sets of data.	Unit - V Statistics 5.1 Range, coefficient of range of discrete and grouped data. 5.2 Mean deviation and standard deviation from mean of grouped and ungrouped data. 5.3 Variance and coefficient of variance. 5.4 Comparison of two sets of observation.	Improved Lecture Tutorial Assignment Demonstration Simulation Flipped Classroom approach

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Solve simple problems of Logarithms based on given applications.	1	Solve simple problems of Logarithms based on given applications.	1	CO1
LLO 2.1 Apply the concept of matrix to solve engineering problems.	2	Solve elementary problems on Algebra of matrices for branch specific engineering related applications.	2	CO1
LLO 3.1 Apply the concept of matrix to solve engineering problems.	3	Solve solution of Simultaneous Equation using inversion method.	2	CO1
LLO 4.1 Apply the concept of matrix to solve engineering problems.	4	Apply Matrix Inversion method to determine currents through various branches of given electrical networks.	2	CO1

MATHEMATICS**Course Code : 331305**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 5.1 Apply the concept of matrix to solve engineering problems.	5	Determine inverse of a non-singular matrix by using open source software.	2	CO1
LLO 6.1 Apply the concept of partial fraction to solve engineering problems.	6	Resolve into partial fraction using linear non-repeated, repeated, and irreducible quadratic factors.	2	CO1
LLO 7.1 Utilize the concept of trigonometry to solve engineering problems.	7	Solve problems on Compound, Allied, multiple and sub multiple angles for related shapes.	2	CO2
LLO 8.1 Utilize the concept of trigonometry to solve engineering problems.	8	Practice problems on factorization and de factorization.	2	CO2
LLO 9.1 Utilize the concept of trigonometry to solve engineering problems.	9	Solve problems on inverse trigonometric ratios based on applications.	2	CO2
LLO 10.1 Solve branch specific engineering problems under given conditions of straight lines.	10	Practice problems on equation of straight lines using different forms.	2	CO3
LLO 11.1 Solve branch specific engineering problems under given conditions of straight lines.	11	Solve problems on perpendicular distance, distance between two parallel lines and angle between two lines.	2	CO3
LLO 12.1 Solve branch specific engineering problems under given conditions of straight lines.	12	Use given form of straight line to calculate the speed, distance and time of moving object.	2	CO3
LLO 13.1 Apply the concept of derivative to solve engineering problems.	13	Solve problems to find derivatives of implicit function and parametric function.	2	CO4
LLO 14.1 Apply the concept of derivative to solve engineering problems.	14	Solve problems to find derivative of logarithmic and exponential functions for engineering applications.	2	CO4
LLO 15.1 Apply the concept of equation of tangent and normal to solve engineering problems.	15	Solve problems based on finding equation of tangent and normal for engineering applications.	2	CO4
LLO 16.1 Apply the concept of maxima, minima and radius of curvature to solve engineering problems.	16	Solve problems based on finding maxima, minima of function and radius of curvature at a given point for engineering applications.	2	CO4
LLO 17.1 Apply the concept of equation of tangent and normal to solve engineering problems.	17	Use the concept of tangent and normal to solve the given problem of Engineering Drawing.	2	CO4
LLO 18.1 Apply the concept of Maxima and Minima to solve engineering problems.	18	Use the concept of Maxima and Minima to obtain optimum value for given engineering problem.	2	CO4
LLO 19.1 Apply the concept of radius of curvature to solve engineering problems.	19	Use the concept of radius of curvature to solve given branch specific engineering problem.	2	CO4
LLO 20.1 Utilize the concept of derivative to solve engineering problems.	20	Use the concept of derivative to find the slope of a bending curve for given engineering problem.	2	CO4

MATHEMATICS**Course Code : 331305**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 21.1 Use concept of range and mean deviation to crack branch specific problems.	21	Solve problems on finding range, coefficient of range and mean deviation for given applications.	2	CO5
LLO 22.1 Use concept of standard deviation and coefficient of variance to crack branch specific problems.	22	Solve problems on standard deviation, coefficient of variation and comparison of two sets.	2	CO5
LLO 23.1 Use concept of standard deviation to crack branch specific problems.	23	Calculate the Standard Deviation for Concrete with the given data for given engineering applications.	2	CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Micro project

- Collect Model on quality control analysis, energy efficiency assessment, environmental monitoring, and process optimization, for these models, analyze data and calculate variance and standard deviation, make a presentation including short videos.
- Collect applications of the radius of curvature on lens design and optics, mirror and reflective surface properties, road and highway design, structural behavior, roller coaster track design, and composite material manufacturing and make a video of 5-minutes duration.
- Collect the Data of Marks obtained by your class in mid sem test. Compute the variance and coefficient of variance of the data and interpret the result using the free open source software ORANGE.
- Visualize trigonometric waveforms and create animations utilizing sine or cosine functions and make a presentation.
- Prepare the model using the concept of radius of curvature to bending of railway tracks, express geometrically the same through any open source software.
- A window in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window to admit maximum light through the whole opening, prepare a model using concept of Maxima and Minima for the above problem and verify the result.
- Prepare charts using determinant to find area of regular shapes
- Apply trigonometric principles to calculate angles, distances, forces, and dimensions relevant to the chosen area and make a poster presentation.
- Prepare models using trigonometry based on at least 10 engineering problems.
- Develop a program of trigonometric function calculator that computes sine, cosine, and tangent values.
- Develop a math game based on operations of matrices.
- Design a puzzle based on matrices. Create a grid of numbers and operations.
- Prepare the model using the concept of tangent and normal bending of roads in case of sliding of a vehicle, express geometrically the same through any open source software.
- Use matrices as a tool for music composition. Assign different musical elements (e.g., notes, chords, rhythms) to matrix elements, and experiment with combining and transforming the matrices to create unique musical compositions. You can use musical notation open software or even traditional instruments to bring your compositions to life.
- Prepare models using matrices to solve simple problems based on cryptography.

MATHEMATICS**Course Code : 331305**

- Create a function that takes a matrix as input and returns its inverse matrix if it exists. Also Implement a program that finds the inverse of a square matrix
- Attempt any 10-12 Micro Projects, out of the given list.

Assignment

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

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Open-source software like Sage Maths, MATHS3D, GeoGebra, Graph, DPLOT, and Graphing Calculator (Graph Eq 2.13), ORANGE can be used for Algebra, Calculus, Trigonometry, and Statistics respectively.	All

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Algebra	CO1	12	2	6	6	14
2	II	Trigonometry	CO2	16	2	6	6	14
3	III	Straight Line	CO3	6	2	2	4	8
4	IV	Differential Calculus	CO4	16	2	8	10	20
5	V	Statistics	CO5	10	2	6	6	14
Grand Total				60	10	28	32	70

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

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

Summative Assessment (Assessment of Learning)

- Micro-project
- Tutorial Performance
- End Term Exam

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	1	-	1	-	1	1			
CO2	3	1	-	-	1	1	1			
CO3	3	-	-	-	-	-	-			
CO4	3	1	1	1	-	1	-			
CO5	3	2	1	1	1	1	1			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Grewal B. S.	Higher Engineering Mathematics	Khanna publication New Delhi , 2013 ISBN: 8174091955
2	Dutta. D	A text book of Engineering Mathematics	New age publication New Delhi, 2006 ISBN: 978-81-224-1689-3
3	Kreyszig, Ervin	Advance Engineering Mathematics	Wiley publication New Delhi 2016 ISBN: 978-81-265-5423-2
4	Das H.K.	Advance Engineering Mathematics	S Chand publication New Delhi 2008 ISBN: 9788121903455

MATHEMATICS**Course Code : 331305**

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

XIII . LEARNING WEBSITES & PORTALS

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

Note :

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

COMMUNICATION SKILLS**Course Code : 331306**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : COMMUNICATION SKILLS
Course Code : 331306

I. RATIONALE

English Language proficiency and Business Communication focus on strong reading, writing, speaking and listening skills. It includes grammar, vocabulary, comprehension and describing skills to enhance overall language proficiency. English for professional purposes aim to equip students with necessary language skills required for professional interactions such as job interviews, resume writing, effective email writing, report writing and negotiation skills. English for academic purposes includes 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: a. Construct correct sentences in English. b. Comprehend passages correctly. c. Communicate effectively by avoiding barriers. d. Use contextual words appropriately. e. Compose formal letters, reports, emails, memo and notice

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Construct correct sentences in English.
- CO2 - Comprehend passages correctly
- CO3 - Communicate effectively by avoiding barriers
- CO4 - Use contextual words appropriately.
- CO5 - Compose formal letters, reports, emails, memo and notice

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme						Credits	Assessment Scheme											Total Marks	
				Actual Contact Hrs./Week			SLHNLH				Paper Duration	Theory				Based on LL & TL				Based on SL			
																Practical							
				CL	TL	LL	FA-TH		SA-TH			Total		FA-PR		SA-PR		SLA					
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min														
331306	COMMUNICATION SKILLS	CMS	AEC	2	-	2	1	5	5	03	30	70	100	40	25	10	25@	10	25	10	175		

COMMUNICATION SKILLS**Course Code : 331306****Total IKS Hrs for Sem. : Hrs**

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

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

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 30 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 phonetic transcription to pronounce words correctly TLO 1.2 Apply 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 Employ the collocations correctly.	Unit - I Vocabulary 1.1 Phonetics : Vowels (12) ,Consonants (24) ,Diphthongs 1.2 Prefix and Suffix : 1. Definition and Examples ii. List of common prefixes and suffixes 1.3 Synonyms and Antonyms : . Vocabulary expansion ii. Context and Usage 1.4 Homophones i. Identifying Homophones ii. Meaning and Context iii. Vocabulary Expansion 1.5 Collocations i. Definition and identification ii Types of collocations	Language Lab Drill classroom learning Reference books
2	TLO 2.1 Formulate paragraphs with synchronized sentence structure on the given situation / topic. TLO 2.2 Develop dialogues to practice language skills in a structured and meaningful way.	Unit - II Paragraph and Dialogue writing 2.1 Types of paragraphs: I. Technical ii. Descriptive iii. Narrative 2.2 Dialogue Writing I. Greetings ii. Development iii. Closing Sentence	Classroom learning Language Lab Reference books Podcast

COMMUNICATION SKILLS**Course Code : 331306**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Apply the Skills of business communication TLO 3.2 Identify the missing Elements in the given communication process. TLO 3.3 Identify the type of communication in the given situation. TLO 3.4 Identify the type of communication barrier TLO 3.5 Overcome communication barriers	Unit - III Introduction to Business Communication 3.1 Business Communication : Definition of communication , Communication Cycle , Process of Communication , Principles of effective communication 3.2 Types of Communication : Formal And Informal , Verbal and Non Verbal , Vertical, Horizontal, diagonal 3.3 Barriers to Communication : Physical Barrier , Psychological barriers , language barriers	Video Demonstrations Case Study Role Play Language Lab youtube videos
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- 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 the picture in your own words 4.3 Diary Entry i. Date ii. Content iii. Name of the writer 4.4 Translation of paragraphs in Marathi and vice versa	Language Lab Classroom learning pictures on situations reference books
5	TLO 5.1 Respond to the given job Advertisement by writing your CV/ Resume. TLO 5.2 Draft business letters for the given situation TLO 5.3 Draft complaint letters for the given situation TLO 5.4 Compose E- mail TLO 5.5 Reports, memo, notice	Unit - V Business Correspondence 5.1 Business Correspondence : Inquiry, order and complaint letters. 5.2 E-mail writing, Email- etiquette. 5.3 Job Application and Resume Writing 5.4 Accident Report, Progress Report 5.5 Memo and Notice	Classroom learning Language Lab Chalk-Board reference books

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 the correct form LLO 1.2 Learn to differentiate vowels, diphthongs and consonants	1	Write 20 words using phonetic transcription	2	CO1
LLO 2.1 Learn correct pronunciation by using headphones in the language lab	2	Practice pronunciation as per IPA using the 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	Form 20 words using Prefixes and Suffixes	2	CO1 CO4

COMMUNICATION SKILLS**Course Code : 331306**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 4.1 Use words and phrases naturally & and effectively LLO 4.2 Enrichment of vocabulary LLO 4.3 Develop overall language skills	4	Construct sentences using 20 collocations	2	CO1 CO4
LLO 5.1 Improves organization and coherence LLO 5.2 Ability to articulate ideas clearly and effectively LLO 5.3 Improves grammar and punctuation	5	Write two paragraphs of 75 words each	2	CO1 CO4
LLO 6.1 Adds depth to narratives LLO 6.2 Better understanding of format and punctuation	6	Compose situational dialogues (Any Two)	2	CO2 CO4
LLO 7.1 Promotes the development of effective communication skills LLO 7.2 Improves non -verbal communication LLO 7.3 Enhances interpersonal skills LLO 7.4 Builds confidence	7	Enact Role Play	2	CO1 CO3
LLO 8.1 Acquire the ability to convey complex ideas in a clear and concise manner LLO 8.2 Expands technical vocabulary LLO 8.3 Enhances the written communication	8	Describe any three technical objects using correct grammar	2	CO1 CO2 CO4
LLO 9.1 Communicate effectively by avoiding barriers	9	Mention the examples of body language used at workplace with suitable pictures and images.	2	CO3
LLO 10.1 Notice and articulate specific elements, colors, shapes, & and other visual aids LLO 10.2 Express observations & interpretations clearly and concisely LLO 10.3 Expands vocabulary	10	Describe a given picture (Any Two)	2	CO1 CO4
LLO 11.1 Express information in coherent and engaging manner LLO 11.2 Builds confidence in social settings	11	Introduce oneself and others	2	CO3
LLO 12.1 Reflect on thoughts, feelings and experiences	12	Write your experience in 50 words	1	CO1 CO4
LLO 13.1 Bridge the language barrier LLO 13.2 Improve language skills &and expand vocabulary	13	Translate paragraph –English to Marathi (vice –Versa vice versa) (Any4)	2	CO1 CO2
LLO 14.1 Reflect on thoughts, feelings, and experiences	14	Write your experience in 50 words on (Four) given situations (Diary Entry)	2	CO1 CO4

COMMUNICATION SKILLS**Course Code : 331306**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 15.1 Explain forms of writing	15	Draft a complaint letter on the given topic.	1	CO4 CO5
LLO 16.1 Explain forms of writing	16	Draft a memo, complaint , inquiry letter,placing an order	4	CO1 CO5
LLO 17.1 Explain e-format of Cover letter and resume	17	Write a job application with resume using computer.	2	CO5
LLO 18.1 Deliver dialogues effectively	18	Enact a Role play on communication.	2	CO3
LLO 19.1 Describe the format of progress report	19	Draft a progress report	2	CO5
LLO 20.1 Compose complaint letter	20	Draft a complaint letter	2	CO5
LLO 21.1 Deliver effective presentations	21	Write and explain the principles of effective communication Explain principles of effective communication through presentation	2	CO3 CO4
LLO 22.1 Explain formal emails with etiquette	22	Compose an Email on the given topic following Email Netiquettes	2	CO5
LLO 23.1 Express ideas effectively	23	Explain the importance of business communication for an organization using a case study	2	CO5
LLO 24.1 Express ideas appropriately	24	Write case studies on language barrier and suggest the remedies to overcome the barrier	2	CO3
LLO 25.1 Describe events sequentially	25	Write the case studies on psychological barriers with examples	2	CO3
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Micro project

- In the first four semesters, the micro-project could be group-based. A suggestive list is given here. Similar micro-projects could be added by the concerned faculty:
- Report different types of episodes/anecdotes occurred in mines.
- Prepare written speeches on given topics
- Prepare and participate in debates and extempore speeches.
- Write a review on the following: Short stories ,Novels ,Films.
- h. Prepare a questionnaire and conduct the interview of Principal/Head of Department/ Senior Faculty Members/ Senior Students/ Industry Personnel, social workers, entrepreneurs, laborer
- Prepare a booklet of the contributions of eminent Indian scientists
- Prepare a podcast referring ancient literature.
- Summarize the contents of any Indian Mythological Book
- Write a biography of any industrialist associated with coal industry
- Prepare a booklet on body language using pictures

COMMUNICATION SKILLS**Course Code : 331306****Note :**

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Language Lab with relevant software and Computer system with all necessary components like; motherboard, random access memory (RAM), read-only memory (ROM), Graphics cards, sound cards, internal hard disk drives, DVD drive, network interface card	All
2	LCD Projector with document reader	All
3	Smart Board with networking	All

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Vocabulary	CO1	16	2	4	6	12
2	II	Paragraph and Dialogue writing	CO2	14	2	4	6	12
3	III	Introduction to Business Communication	CO3,CO5	24	4	6	6	16
4	IV	Communicative Language	CO4	12	2	4	8	14
5	V	Business Correspondence	CO5	24	4	4	8	16
Grand Total				90	14	22	34	70

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

- -
- -

Summative Assessment (Assessment of Learning)

- -

XI. SUGGESTED COS - POS MATRIX FORM

COMMUNICATION SKILLS**Course Code : 331306**

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

Legends :- High:03, Medium:02,Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	MSBTE Textbook	(Spectrum, G Scheme & I Scheme)	MSBTE
2	Kumar, E. Suresh; Sreehari, P.; Savithri, J	Effective English with CD	– Pearson Education, Noida, New Delhi, 2009 ISBN: 978-81-317-3100-0
3	Gnanamurali, M	English Grammar at Glance	Chand and Co. New Delhi, 2011 ISBN:9788121929042
4	M Ashraf Rizvi	Effective Communication Skills	Tata McGraw-Hill Publication
5	Sanjay Kumar and Pushp Lata	Communication Skills	Oxford University Press
6	English Communicative A book with a difference	English Communicative A book with a difference	Golden
7	Dr. Anjana Tiwari	Communication Skills and English	AICTE

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	www.newagegolden.com	speech, picture description
2	https://www.britishcouncil.in/english/learn-online	phonetics
3	http://www.talkenglish.com/	conversations

Note :

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

SPORTS, YOGA AND MEDITATION**Course Code : 331001**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : SPORTS, YOGA AND MEDITATION
Course Code : 331001

I. RATIONALE

Sports or Physical Education, Yoga and Meditation is an integral part of a person's overall well-being and is imperative for a healthy mind and body balance. Diploma holder in technical education needs a sound body and mind to face the challenging situations in career as employee or as an entrepreneur. Sports, Yoga and Meditation brings about the holistic development of the student and equips with necessary balance to handle the challenges. The age of polytechnic student is appropriate to get introduced to sports, yoga practice as this will help him 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 enables a student to focus on concentration ability to bring piece & calm to the 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 health benefits as general and specific to adopt in daily life practice.

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

After the completion of the course, teachers are expected to ensure the accomplishment of following course outcomes by the learners. For this, the learners are expected to perform various activities related to three learning domains (Cognitive, Psychomotor and Affective) in classroom/laboratory/workshop/field/ industry.

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

- CO1 - Select appropriate physical activities and Sports to maintain healthy lifestyle.
- CO2 - Use fitness and wellness techniques for optimal health and wellbeing.
- CO3 - Practice basic Yoga and Pranayama in daily life to maintain physical and mental fitness.
- CO4 - Practice meditation regularly for improving concentration and better handling of stress and anxiety.
- CO5 - 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 & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Min		Max					Min	Max	Min	Max	Min		
331001	SPORTS, YOGA AND MEDITATION	MEI	SEC	-	-	1	1	2	2	-	-	-	-	-	50	20	-	-	25	10	75

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.* 30 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
--	-------	--	----------------	--------------

SPORTS, YOGA AND MEDITATION**Course Code : 331001**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Perform various sports activities for overall growth and development LLO 1.2 Select suitable sport activities as per your need.	1	Practice 01 : Practice minimum two activities from below 1. Perform track and field activities like running, jumping, walking and throwing, cycling event correctly to develop endurance, speed, strength, agility, flexibility etc. 2. Perform aerobics and gymnastics under the guidance of coach to develop strength, agility and flexibility 3. Practice net/wall sports like volleyball and basketball to develop endurance, strength, agility and flexibility 4. Practice striking and fielding sports like cricket, bowling, hockey, football baseball etc. to develop endurance, speed, strength, agility, flexibility and coordination 5. Practice racket games like tennis, badminton, table tennis etc. to develop endurance, speed, strength, agility and flexibility 6. Practice outdoor games like Kho-Kho and Kabaddi to develop endurance, speed, strength, agility and flexibility 7. Practice indoor games like chess and carrom, swimming, boxing, karate weightlifting, power lifting, physique training, archery, roller skating etc. to develop concentration. 8. Organize adapted sports for various levels of physically challenged and impairments.	5	CO1
LLO 2.1 Practice warming up for Yoga.	2	Practice 02 : Introduction : Presentation on Introduction to Yoga and its history Perform warming up exercises to prepare the body from head to toe for Yoga.(Trainer will explain the importance of Yoga and ask students to perform warming up exercises under his supervision, few of them will be included in every practical sessions.) Start and end of the Practical will be with appropriate Yoga prayers and chanting of Omkar.	3	CO2

SPORTS, YOGA AND MEDITATION

Course Code : 331001

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 3.1 Practice Surya Namaskar	3	Practice 03 : Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go. Follow up experiment 2 to 4 with shavasana for self relaxation	4	CO3
LLO 4.1 Practice basic Asanas	4	Practice 04 : Perform Sarvangasana, Halasana, Kandharasana (setubandhasana) Perform Bhujangasana, Naukasana, Mandukasana Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Perform VeeraBhadrasana, Vrukshasana, Trikonasana. Follow up experiment 5 to 7 with shavasana for self relaxation	5	CO3 CO4
LLO 5.1 Practice basic pranayama	5	Practice 05: Perform Bhastrika , Anulom Vilom Pranayam Kriya Practice Kapalbhatai Pranayam Kriya Lab Exp:10 Practice Bhramary Pranayam.	4	CO2 CO3
LLO 6.1 Practice meditation	6	Practice 06: 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)	4	CO4
LLO 7.1 Prepare diet chart for optimal health and wellbeing	7	Practice 07: Prepare a diet chart for the given sport.	2	CO5

SPORTS, YOGA AND MEDITATION**Course Code : 331001**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 8.1 Follow good personal hygiene to ensure safety of food	8	Practice 08: Calculate your Body Composition (BMI) Identify Sources of Microbial contamination within human body and Good Hygiene practices Personal Cleanliness and behaviors A. Unhygienic practices in food handling areas and personal habits - Don'ts B. Personal grooming . C. Handwashing i. Importance of hand washing ii. Types of hand washing techniques iii. Steps in handwashing iv. Moments of hand hygiene (when should one wash his/her hand) v. Using antiseptics, hand rubs gels or alcohol swabs for hand antiseptis D. Clothing and headgear – Personal protective Equipment	4	CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Micro project

- Identify and synthesize the factors that influence health in various situations (05 situations). Prepare a report with details of situations and solutions to remove the factors.
- Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of students/ members
- Visit different sports club, gyms, and schools and identify various measure taken by them for Fitness and wellness of physically challenged students/ members
- Identify which type of stress, anxiety and depression students are facing and steps and solutions to overcome this.
- Interact with the persons who have adopted yoga and meditation techniques as part of their life and prepare a case study to explain how Mr 'X' has benefitted by using mediation/yogatechniques.

Assignment

SPORTS, YOGA AND MEDITATION**Course Code : 331001**

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

Self Learning

- Watch videos on Yoga and food hygiene
- Read books on different methods to maintain health, wellness and to enhance mood

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Yoga Mats, Yoga Rollers, Yoga Blocks, Aero Yoga Clothing Blankets, cloth Straps, Bolsters, Wheels	2,3,4,5,6
2	Weight machine	8

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

- Practical Performance, Self Learning and Term Work

Summative Assessment (Assessment of Learning)

- Actual Practical Performance and Demonstration

XI. SUGGESTED COS - POS MATRIX FORM

SPORTS, YOGA AND MEDITATION**Course Code : 331001**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1					3		2			
CO2					3		2			
CO3					3		2			
CO4					3		2			
CO5					3		2			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	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	? DK Publisher, (2019) ISBN-13?: ? 978-1465479358
6	Joseph P. Winnick, David L. Porretta	Adapted Physical Education and Sport Sixth Edition	Human Kinetics, (2016) ISBN-13?: ? 978-1492511533
7	Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW	The Relaxation and Stress Reduction Workbook	A New Harbinger Self-Help Workbook (2019)

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 Practices

SPORTS, YOGA AND MEDITATION**Course Code : 331001**

Sr.No	Link / Portal	Description
2	https://onlinecourses.swayam2.ac.in/aic23_ge09/preview- Yoga for Creativity	Yoga Practices
3	https://onlinecourses.swayam2.ac.in/aic23_ge05/preview- Yoga for concentration	Pranayam Practices
4	https://onlinecourses.swayam2.ac.in/aic23_ge06/preview- yoga for memory development	Yoga Practices
5	https://onlinecourses.nptel.ac.in/noc21_hs29/preview- Psychology of Stress, Health and Well-being	Yoga Practices
6	https://onlinecourses.swayam2.ac.in/nce19_sc04/preview- Food Nutrition for Healthy Living - Course –	Yoga Practices
7	https://www.classcentral.com/course/swayam-fitness-management-17608- Fitness Management from Swayam	Yoga Practices
8	https://onlinecourses.swayam2.ac.in/nce19_sc04/preview- Food Nutrition for Healthy Living	Food and Nutrition
9	https://onlinecourses.swayam2.ac.in/cec22_ed31/preview Sports Administration and Management	Sports and Management

Note :

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

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

ENGINEERING GRAPHICS**Course Code : 331002**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : ENGINEERING GRAPHICS
Course Code : 331002

I. RATIONALE

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

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Prepare engineering drawing manually using prevailing drawing instruments

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

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

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme																	
				Actual Contact Hrs./Week	SLH			NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks						
															Practical												
											CL	TL	LL	FA-TH	SA-TH	Total		FA-PR				SA-PR		SLA			
																		Max				Min	Max	Min	Max	Min	Max
331002	ENGINEERING GRAPHICS	EGR	DSC	1	-	2	-	3	3	-	-	-	-	-	50	20	50@	20	-	-	100						

Total IKS Hrs for Sem. : 2 Hrs

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

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

ENGINEERING GRAPHICS**Course Code : 331002**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 Explain methods of Orthographic Projections TLO 3.2 Draw orthographic views of simple 2D entities containing lines, circles and arcs only TLO 3.3 Draw the orthographic views from given pictorial views. TLO 3.4 Use of IS code IS SP-46 for dimensioning technique.	Unit - III Orthographic projections 3.1 Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications 3.2 Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle	Demonstration Model Demonstration Chalk-Board
4	TLO 4.1 Prepare isometric scale. TLO 4.2 Draw isometric views of simple 2D entities containing lines, circles and arcs only. TLO 4.3 Interpret the given orthographic views TLO 4.4 Draw Isometric views from given orthographic views	Unit - IV Isometric Projections 4.1 Introduction to Isometric projection 4.2 Isometric scale and Natural Scale 4.3 Isometric view and isometric projection. 4.4 Illustrative problems related to simple objects having plain, slanting, cylindrical surfaces and slots on slanting surfaces 4.5 Conversion of orthographic views into isometric View/projection.	Chalk-Board Model Demonstration Demonstration
5	TLO 5.1 Sketch proportionate freehand sketches of given machine elements. TLO 5.2 Select proper fasteners and locking arrangement.	Unit - V Free Hand Sketches of engineering elements 5.1 Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements	Model Demonstration 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 Use of drawing instruments	1	Draw horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Setsquares/ drafter. (Sketch Book).	2	CO1
LLO 2.1 Use of IS code related to dimensioning standard.	2	Draw different types of lines, dimensioning styles (Sketch Book)	2	CO1
LLO 3.1 Practice of drawing as per given sketch	3	Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (Sketch Book)	2	CO1
LLO 4.1 Use IS Standard for drawing different figures	4	Draw one figure showing dimensioning techniques, two problems on redraw the figures and one problem on loci of points - slider crank mechanism. (01 Sheet)	4	CO1

ENGINEERING GRAPHICS**Course Code : 331002**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 5.1 Identify different Engineering curves	5	Draw any four Engineering Curves (Sketchbook)	2	CO1
LLO 6.1 Draw different engineering Curves	6	Draw any four Engineering Curves – (01 Sheet)	4	CO1
LLO 7.1 Apply method of projection for drawing simple orthographic views	7	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (Sketchbook)	2	CO2 CO4
LLO 8.1 Draw Simple orthographic views using first angle method of projection	8	Draw two problems on orthographic projections using first angle method of projection having plain surfaces, slanting surfaces and slots etc.- (01 Sheet)	4	CO2 CO4
LLO 9.1 Apply method of projection for drawing complex orthographic views	9	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc. (Sketchbook)	2	CO2 CO4
LLO 10.1 Draw orthographic projection of complex job	10	Draw two problems on orthographic projections using first angle method of projection having cylindrical surfaces, ribs etc.- (01 Sheet)	4	CO2 CO4
LLO 11.1 Draw simple isometric projections	11	Draw two problems on Isometric view of simple objects having plain and slanting surfaces using natural scale. (Sketchbook)	2	CO3 CO4
LLO 12.1 Apply different scales for drawing isometric projections.	12	Draw two problems on Isometric view of simple objects having plain and slanting surfaces using natural scale. (01 sheet)	4	CO3 CO4
LLO 13.1 Draw simple isometric projections	13	Draw two problems on Isometric Projection of objects having cylindrical surfaces and slot on slanting surfaces by using isometric scale.(Sketchbook)	2	CO3 CO4
LLO 14.1 Apply different scales for drawing isometric projections	14	Draw two problems on Isometric Projection of objects having cylindrical surfaces and slot on slanting surfaces by using isometric scale. (01 sheet)	4	CO3 CO4
LLO 15.1 Draw Orthographic views of a given object.	15	Problem Based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views (sketch book).	2	CO2 CO4
LLO 16.1 Draw standard discipline oriented components using free hand	16	Draw freehand Sketches of 12 different standard components (Sketch book)	2	CO5
LLO 17.1 Draw standard discipline oriented components using free hand	17	Draw freehand Sketches of 12 different standard components (1 Sheet)	2	CO5
LLO 18.1 Collect information of an ancient Indian culture related to engineering graphics	18	Correlate ancient Indian sculptures, Indian temples, Monuments, etc. with Engineering Graphics	2	CO1 CO2 CO3 CO4 CO5

ENGINEERING GRAPHICS**Course Code : 331002**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
Note : Out of above suggestive LLOs - '*' Marked Practicals (LLOs) Are mandatory. - Minimum 80% of above list of lab experiment are to be performed. - Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

Assignment

- N.A

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Models/ Charts of objects mentioned in unit no. 5	16,17
2	Models of objects for orthographic / isometric projections	7,8,9,10,11,12,13,14,15
3	Drawing Table with Drawing Board of Full Imperial/ A1 size.	All
4	Set of various industrial drawings being used by industries.	All
5	Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers and made used available on the MSBTE portal to be used as reference/standards.	All
6	Drawing equipment and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squares (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing sheets, Drawing pencils, Eraser, Drawing pins / clips	All

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Basic Elements of Drawing	CO1	3	0	0	6	6

ENGINEERING GRAPHICS**Course Code : 331002**

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
2	II	Engineering curves & Loci of Points	CO1	6	0	0	6	6
3	III	Orthographic projections	CO2,CO4	8	0	0	14	14
4	IV	Isometric Projections	CO3,CO4	8	0	0	14	14
5	V	Free Hand Sketches of engineering elements	CO4,CO5	5	2	2	6	10
Grand Total				30	2	2	46	50

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

- practical Examination -Internal Examiner will set Question paper of 50 Marks as per suggested weigh

XI. SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3	-	-	2	-	2	-			
CO2	3	-	-	2	-	2	-			
CO3	3	-	-	2	-	2	-			
CO4	3	-	-	2	-	2	-			
CO5	3	-	-	2	-	2	-			
Legends :- High:03, Medium:02,Low:01, No Mapping: - *PSOs are to be formulated at institute level										

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Bureau of Indian Standards	Engineering Drawing Practice for Schools and Colleges IS:SP-46	Third Reprint, October 1998 ISBN No. 81-7061-091-2
2	Bhatt, N.D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt, N.D.; Panchal, V.M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe, D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1

ENGINEERING GRAPHICS**Course Code : 331002**

Sr.No	Author	Title	Publisher with ISBN Number
5	Dhawan, R. K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Pradhan, S.K Jain, K.K	Engineering Graphics	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9

XIII . LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	https://www.youtube.com/watch?v=TJ4jGyD-WCw	Free Hand Sketches
2	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Orthographic Projection
3	https://www.youtube.com/watch?v=_MQScnLXL0M	Orthographic Projection
4	https://www.youtube.com/watch?v=3WXPanCq9LI	Methods of Projections
5	https://www.youtube.com/watch?v=fvjk7PlxAuo	Introduction to Engineering graphics
6	https://www.youtube.com/watch?v=8j7l1OWhMIE	Isometric Projections

Note :

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

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

FUNDAMENTALS OF ICT**Course Code : 331003**

Programme Name/s : Mining & Mine Surveying/ Mining Engineering
Programme Code : MS/ MZ
Year : First
Course Title : FUNDAMENTALS OF ICT
Course Code : 331003

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 outcomes through various teaching learning experiences: • Use computers for internet services, electronics documentation, data analysis and slide presentation. • Have an overview of emerging Technologies • Use fundamental concept to solve given problem in programming languages

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 - Prepare Database and Tables in MS Access.
- CO6 - Use different types of web browsers and Apps.
- CO7 - Explain concept and applications of Emerging Technologies.
- CO8 - Use of Algorithm and flowchart to solve given problem.

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme												Total Marks
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL			
															Practical							
				CL	TL	LL					FA-TH		SA-TH		Total		FA-PR		SA-PR		SLA	
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min											
331003	FUNDAMENTALS OF ICT	ICT	SEC	1	-	2	-	3	3	-	-	-	-	-	50	20	50#	20	-	-	100	

Total IKS Hrs for Sem. : Hrs

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

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

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.* 30 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. 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, 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.	Teachers Input Demonstration supported by media

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
2	TLO 2.1 Write 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	Teachers Input Demonstration Hands-on Collaborative learning

FUNDAMENTALS OF ICT**Course Code : 331003**

Sr.No	Theory Learning Outcomes (TLO's) aligned to CO's.	Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.	Suggested Learning Pedagogies.
3	TLO 3.1 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 P 3.3 Formatting Cells and sheet: Setting Cell Type, Setting Fonts, Text options, Rotate Cells, Setting Colors, Text Alignments, Merge and Wrap, apply Borders and Shades, Sheet Options, Adjust Margins, Page Orientation, Header and Footer, Insert Page Breaks, S 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.	Teachers Input Demonstration Hands-on

FUNDAMENTALS OF ICT**Course Code : 331003**

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 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. TLO 4.6 Write the steps to create database and tables in Access. TLO 4.7 Run queries on tables to extract information. TLO 4.8 Write the steps to create forms and report generation and perform calculations.	Unit - IV Presentation Tool and MS Access 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 Present 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. 4.5 Create Database, Data types, view database, create table, table design, import data into tables, working with fields, 4.6 Database Operations, sorting records, creating query using wizard, creating a query in design view, getting information with query, performing calculations in queries. 4.7 create form, working with a form in Design view, entering and editing data in form, modifying form, create report, modify report in design view, performing calculations in reports, formatting a form or report.	Teachers Input Demonstration Hands-on

FUNDAMENTALS OF ICT**Course Code : 331003**

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 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 type of web service. TLO 5.4 Explain concepts and applications of emerging technologies. TLO 5.5 Use various elementary cloud-based tools. TLO 5.6 Explain concept of Number system. TLO 5.7 Explain concept of algorithm and Flowchart. TLO 5.8 Use the concept of algorithm and flowchart to solve given problem.	Unit - V Basics of Internet and Emerging Technologies. Programming Fundamentals 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, sheets, slide, drive, forms, quiz, translate and other Apps. 5.5 Number System: Binary, Octal, Hexadecimal, Decimal and conversion, Basic Logic Gates. 5.6 Fundamental of Algorithm: Notion of an algorithm, Pseudo-code conventions like assignment statements and basic control structure. 5.7 Flowchart: Symbols of flow chart, guidelines to prepare flowchart. 5.8 Algorithmic Problems: i) solve simple arithmetic expression ii) find the greatest of three numbers iii) Determine whether given number is even or odd.	Teachers Input Demonstration Hands-on

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

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 1.1 Identify various Input/output devices, their connections and peripherals of computer system. LLO 1.2 Work with Computer System, Input/output devices, and peripherals to manage file and folders for data storage.	1	a) Work with Computer System, Input/output devices, and peripherals. b) Work with files and folders	4	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

FUNDAMENTALS OF ICT**Course Code : 331003**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
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	a) Document page layout, Themes, and printing. b) Use mail merge with options.	2	CO2
LLO 6.1 Enter data and format it 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	Use Formulas and functions in Worksheet.	4	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	Slides show Presentation.	4	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.	4	CO4
LLO 14.1 Create database and tables in access. LLO 14.2 use data type, primary key and data validation in Access.	14	Work with Access	4	CO5
LLO 15.1 insert, delete and updata data into database LLO 15.2 Rearrange fields in Database	15	Perform various operation on Database.	4	CO5
LLO 16.1 create a form using controls	16	Work with forms in Access	4	CO5
LLO 17.1 Apply queries to extract data from database	17	Extract data using query	4	CO5

FUNDAMENTALS OF ICT**Course Code : 331003**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 18.1 Configure internet connection on a computer system. LLO 18.2 Use different web services on internet.	18	a) Internet connection configuration b) Use Internet and web services.	2	CO6
LLO 19.1 Configure different browser settings. LLO 19.2 Use browsers for the given purpose.	19	Work with Brower.	2	CO6
LLO 20.1 Create web forms for survey using different options.	20	Prepare web forms for survey.	2	CO7
LLO 21.1 Create web forms for Quiz using different options.	21	Prepare web forms for Quiz	2	CO7
LLO 22.1 Write Algorithm and flowchart for given problem.	22	Algorithm and flowcharts.	2	CO8

Note : Out of above suggestive LLOs -

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

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

- Prepare journal of practical performed in the laboratory.

Micro project

- 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)
- 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).
- Student Marksheet, Prepare Pay bills, tax statement, student's assessment record using spreadsheet. (Teacher shall assign a spreadsheet to be prepared by each student).
- Carry-out Survey on different web browsers.
- Perform a survey on various input and output devices available in market and make its report.
- Generate resume for different job profile, survey report of any industry using ChatGPT/any other AI tool.

Assignment

- Use ChatGPT/any other AI tool to explore information.
- Explore the Social Media Platform.
- Use of Online digital repositories for lectures, course materials, and digital library.
- Commonly used file formats and their format conversion.
- Use of various cloud-based Apps applicable in education.

Note :

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Computer system with all necessary peripherals and internet connectivity.	All
2	Any Office Software	All
3	c) Any browser	All

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

Sr.No	Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	I	Introduction to Computer System	CO1	3	0	0	6	6
2	II	Word Processing	CO2	6	0	0	6	6
3	III	Spreadsheets	CO3	8	0	0	14	14
4	IV	Presentation Tool and MS Access	CO4,CO5	8	0	0	14	14
5	V	Basics of Internet and Emerging Technologies. Programming Fundamentals	CO6,CO7	5	2	2	6	10
Grand Total				30	2	2	46	50

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

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

Summative Assessment (Assessment of Learning)

- Lab performance
- viva voce

XI. SUGGESTED COS - POS MATRIX FORM

FUNDAMENTALS OF ICT**Course Code : 331003**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3						3			
CO2	3						3			
CO3	3						3			
CO4	3		2				3			
CO5	3		2	1			3			
CO6										
CO7										
CO8										

Legends :- High:03, Medium:02,Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Goel, Anita	Computer Fundamentals	Pearson Education, New Delhi, 2014, ISBN-13: 978-8131733097
2	Miller, Michael	Computer Basics Absolute Beginner's Guide, Windows 10	QUE Publishing; 8th edition August 2015, ISBN: 978-0789754516
3	Alvaro, Felix	Linux: Easy Linux for Beginners	Creative Space 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	Open Office.org for Dummies	Wiley Publishing, New Delhi, 2003 ISBN : 978-0764542220
7	Steve Johnson	Office 2010 on Demand	Pearson, ISBN: 978-81-317-7064-1

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 Fundamentals

FUNDAMENTALS OF ICT**Course Code : 331003**

Sr.No	Link / Portal	Description
5	https://www.tutorialspoint.com/computer_fundamentals/index.htm	Computer Fundamentals
6	https://www.tutorialspoint.com/word/	Word Processing
7	https://www.javatpoint.com/ms-word-tutorial	Word Processing
8	https://support.microsoft.com/en-au/office/word-for-windows-training-7bcd85e6-2c3d-4c3c-a2a5-5ed8847	Word Processing
9	https://www.javatpoint.com/excel-tutorial	Spreadsheet
10	https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb	Spreadsheet
11	https://www.javatpoint.com/powerpoint-tutorial	Powerpoint Presentation
12	https://support.microsoft.com/en-au/office/powerpoint-for-windows-training-40e8c930-cb0b-40d8-82c4-b	Powerpoint Presentation
13	https://www.tutorialspoint.com/ms_access/index.htm	MS Access
14	https://support.microsoft.com/en-us/office/access-video-training-a5ffb1ef-4cc4-4d79-a862-e2dda6ef38e	MS Access
15	https://www.javatpoint.com/microsoft-access	MS Access
16	https://www.geeksforgeeks.org/ms-dos-operating-system/	Operating system
17	https://www.javatpoint.com/windows	Windows Operating System
18	https://www.javatpoint.com/what-is-linux	Linux Operating System
19	https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT	IoT
20	https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/	IoT
21	https://www.javatpoint.com/machine-learning	AI & Machine Learning
22	https://www.skillrary.com/blogs/read/introduction-to-drone-technology	Drone Technology
23	https://www.cnet.com/tech/computing/what-is-3d-printing/	3D Printing
24	https://support.google.com/a/users/answer/9389764?hl=en	Apps

Note :

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

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

WORKSHOP PRACTICES**Course Code : 331004****Programme Name/s : Mining & Mine Surveying/ Mining Engineering****Programme Code : MS/ MZ****Year : First****Course Title : WORKSHOP PRACTICES****Course Code : 331004****I. RATIONALE**

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

II. INDUSTRY / EMPLOYER EXPECTED OUTCOME

Use different engineering tools for performing shop floor activities

III. COURSE LEVEL LEARNING OUTCOMES (COS)

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

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

IV. TEACHING-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
							Max	Min		Max					Min	Max	Min	Max	Min		
331004	WORKSHOP PRACTICES	WSP	SEC	-	-	2	-	2	2	-	-	-	-	-	50	20	50@	20	-	-	100

WORKSHOP PRACTICES**Course Code : 331004****Total IKS Hrs for Sem. : 2 Hrs**

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

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

Note :

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

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

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

WORKSHOP PRACTICES**Course Code : 331004**

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

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

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

WORKSHOP PRACTICES**Course Code : 331004**

Practical / Tutorial / Laboratory Learning Outcome (LLO)	Sr No	Laboratory Experiment / Practical Titles / Tutorial Titles	Number of hrs.	Relevant COs
LLO 12.1 Select proper sheet metal tools LLO 12.2 Prepare sheet metal component using different operations	12	Prepare sheet metal utility job using following operations a. Cutting And Bending b. Edging c. End curling d. Lancing e. Soldering f. Riveting	6	CO5
LLO 13.1 Collect information about ancient tools for understanding Indian Knowledge.	13	Draw sketches of various ancient tools	2	CO1 CO2 CO3 CO4 CO5
Note : Out of above suggestive LLOs - • '*' Marked Practicals (LLOs) Are mandatory. • Minimum 80% of above list of lab experiment are to be performed. • Judicial mix of LLOs are to be performed to achieve desired outcomes.				

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

- NA

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

VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
1	Fire buckets of standard size.	1,2
2	Fire extinguisher A,B and C types	1,2
3	Sheet Bending Machine	12
4	Sheet Cutting Machine	12
5	Brazing Equipment	12
6	Sheet metal hand tools- snip, shears sheet gauge, straight edge, L square, scribe, divider, trammel, punches, pliers, stakes, groovers, limit set	12

WORKSHOP PRACTICES**Course Code : 331004**

Sr.No	Equipment Name with Broad Specifications	Relevant LLO Number
7	Work Benches- size:1800 x 900 x 750 mm	3
8	Bench Drilling machine (upto 13 mm drill cap.) with ½ H.P. Motor 1000 mm. Height.	4
9	Power Saw machine 350 mm mechanical with 1 HP Motor & all Accessories.	4
10	Bench Grinder 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore 32 mm. with ½ HP/1HP Motor.	4
11	Bench Vice 100 mm	4
12	Fitting tools - hammers, chisels, files, hacksaw, surface plate, punch, v block, angle plate, try square, marking block, steel rule, twist drills, reamers, tap set, die set.	4
13	Circular Saw Machine, Diameter of saw blade 200 mm, Maximum Depth of Cut 50 mm, Table Size -350 x 450 mm, Table Tilting - 450 mm	4,5
14	Portable Hammer Drill Machine 0-13 mm A.C. 230 V, 2.5Amp, Pistol type, having different types of bits	4,7
15	Wood Turning Lathe Machine, Height of Centre: 200mm, Distance between Centers: 1200mm, Spindle Bore: 20mm with Taper, Range of Speeds: 425 to 2800 with suitable Motor Drive. with all accessories	5
16	Wood working tools- marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares,	5
17	Carpentry Vice 200 mm (Qty 10)	5
18	Pipe Bending Machine	6,7
19	Pipe Vice – 100 mm	6,7
20	Pipe Cutter- 50 mm	6,7
21	Plumbing tools- pipe vice, pipe bending equipment, pipe wrenches, dies.	6,7,8
22	Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter	6,7,8
23	Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthing clamp, wire brush.	6,7,8
24	Welding machine 20 KVA 400A welding current 300A at 50, 100, 200, 250, 300 with std. Accessories and Welding Cable 400 amp. ISI with holder	8,9,10,11
25	Oxygen and acetylene gas welding and cutting kit with cylinders and regulators.	8,9,10,11
26	Vernier height Guage 450 mm	All
27	Surface Plate 600 x 900 mm Grade I	All
28	Angle Plate 450 x 450 mm	All

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

- Practical Examination based on curriculum

XI. SUGGESTED COS - POS MATRIX FORM

WORKSHOP PRACTICES**Course Code : 331004**

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes* (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/ Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	PSO-1	PSO-2	PSO-3
CO1	3			2	3	2	2			
CO2	3			3	2	2	2			
CO3	3			3	2	2	2			
CO4	3			3	2	2	2			
CO5	3			3	2	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
 *PSOs are to be formulated at institute level

XII. SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher with ISBN Number
1	Bawa, H.S.	Workshop Practice	McGraw Hill Education, Noida; ISBN-10: 0070671192 ISBN-13: 978-0070671195
2	Gupta, J.K.; Khurmi, R.S.	A Textbook of Manufacturing Process (Workshop Tech.)	S.Chand and Co. New Delhi ISBN:81-219-3092-8
3	Hegde, R.K.	Workshop Practice Manual For Engineering Diploma & ITI Students	Sapna Book House, 2012, ISBN:13: 9798128005830
4	Singh, Rajender	Introduction to Basic Manufacturing Process & Workshop Technology	New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7
5	Hajra Choudhary;	Elements of Workshop Technology	Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146
6	Sarathe, A.K	Engineering Workshop Practice	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-51-6
7	Sarathe, A.K	Engineering Workshop Practice	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-51-6

XIII. LEARNING WEBSITES & PORTALS

Sr.No	Link / Portal	Description
1	http://www.asnu.com.au	Basic engineering tools.
2	http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf	wood working
3	http://www.weldingtechnology.org	Welding Technology
4	http://www.newagepublishers.com/samplechapter/001469.pdf	Engineering Tools
5	http://www.piehtoolco.com	Engineering Tools
6	http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf	wood working

WORKSHOP PRACTICES**Course Code : 331004**

Sr.No	Link / Portal	Description
Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students		

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