Jharkhand University of Technology
Ranchi, 834010

SYLLABUS

For Diploma Program in

Diploma (Mining and Mine Surveying/ Mining Engineering)
(Effective from 2024-25)

DEPARTMENT OF MINING ENGINEERING

(1st – SEMESTER)

Engineering Mathematics

RATIONALE

Engineering Mathematics specification provides students with access to important mathematical ideas to develop the mathematical knowledge and skills that they will draw on in their personal and work lives. The course enables students to develop mathematical conceptualization, inquiry, reasoning, and communication skills and the ability to use mathematics to formulate and solve problems in everyday life, as well as in mathematical contexts. At this level, the mathematics curriculum further integrates the three content areas taught in the higher grades into three main learning areas: Algebra; Measurement of angles and Trigonometry and Calculus.

1. COURSE SKILL SET

Student will be able to:

1. Solve system of linear equations arise in different engineering fields
2. Incorporate the knowledge of calculus to support their concurrent and subsequent engineering studies
3. Adept at solving quantitative problems
4. Ability to understand both concrete and abstract problems
5. Proficient in communicating mathematical ideas
6. Detail-oriented

2. COURSE OUT COMES

At the end of the course, student will be able to

CO1	Determine the inverse of a square matrix using matrix algebra. Apply the concepts of matrices and determinants to solve system of linear equations and find eigen values associated with the square matrix.
CO2	Find the equation of straight line in different forms. Determine the parallelism and perpendicularity of lines.
CO3	Calculate trigonometric ratios of allied angles and compound angles. Transform sum or difference of trigonometric ratios into product and vice versa.
CO4	Differentiate various continuous functions and apply the concept in real life situations.
CO5	Integrate various continuous functions and apply the concept in evaluating the area and volume through definite integrals.

3. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 MATRICES AND DETERMINANTS	➢ Use algebraic skills which are essential for the study of systems of linear equations, matrix algebra and eigen values	1.1 Matrix and types 1.2 Algebra of Matrices (addition, subtraction, scalar multiplication and multiplication) 1.3 Evaluation of determinants of a square matrix of order 2 and 3. Singular matrices 1.4 Cramer's rule for solving system of linear equations involving 2 and 3 variables 1.5 Adjoint and Inverse of the non-singular matrices of order 2 and 3 1.6 Characteristic equation and Eigen values of a square matrix of order 2	
UNIT-2 STRAIGHT LINES	➢ Able to find the equation of a straight line in different forms ➢ Determine whether the lines are parallel or perpendicular	2.1 Slope of a straight line 2.2 Intercepts of a straight line 2.3 Intercept form of a straight line 2.4 Slope-intercept form of a straight line 2.5 Slope-point form of a straight line 2.6 Two-point form of a straight line 2.7 General form of a straight line 2.8 Angle between two lines and conditions for lines to be parallel and perpendicular 2.9 Equation of a straight line parallel to the given line 2.10 Equation of a straight line perpendicular to the given line	
UNIT-3 TRIGONOMETRY	➢ Use basic trigonometric skills in finding the trigonometric ratios of allied and compound angles ➢ Able to find all the measurable dimensions of a triangle	3.1 Concept of angles, their measurement, Radian measure and related conversions. 3.2 Signs of trigonometric ratios in different quadrants (ASTC rule) 3.3 Trigonometric ratios of allied angles (definition and the table of trigonometric ratios of standard allied angles say $90^0 \pm \Theta$, $180^0 \pm \Theta$, $270^0 \pm \Theta$ and $360^0 \pm \Theta$) 3.4 Trigonometric ratios of compound angles (without proof) 3.5 Trigonometric ratios of multiple angles 3.6 Transformation formulae	

UNIT-4 DIFFERENTIAL CALCULUS AND APPLICATIONS	Able to differentiate algebraic, exponential, trigonometric, logarithmic and composite functions Able to find higher order derivatives Understand and work with derivatives as rates of change in mathematical models Find local maxima and minima of a function	4.1 Derivatives of continuous functions in an interval (List of formulae) 4.2 Rules of differentiation 4.3 Successive differentiation (up to second order) 4.4 Applications of differentiation	
UNIT-5 INTEGRAL CALCULUS AND APLICATIONS	➢ Understand the basic rules of integration and Evaluate integrals with basic integrands. ➢ Identify the methods to evaluate integrands ➢ Apply the skills to evaluate integrals representing areas and volumes	5.1 List of standard integrals and Basic rules of integration 5.2 Evaluation of integrals of simple function and their combination 5.3 Methods of integration 5.4 Concept of definite integrals 5.5 Applications of definite integrals	

SUGGESTED LEARNING RESOURCES:

Sl. No.	Author	Title of Books	Publication/Year
1	B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers, New Delhi, 40th Edition,2007
2	G. B. Thomas, R. L.Finney	Calculus and Analytic Geometry	Addison Wesley, 9th Edition, 1995
3	S.S. Sabharwal, Sunita Jain, Eagle Parkashan	Applied Mathematics, Vol. I & II	Jalandhar.
4	Comprehensive Mathematics	Comprehensive Mathematics Vol. I & II	Laxmi Publications, Delhi
5	ReenaGarg &Chandrika Prasad	Advanced Engineering Mathematics	Khanna Publishing House, New Delhi

DETAILED COURSE CONTENT

UNIT NO AND NAME	DETAILED COURSE CONTENT
1 MATRICES AND DETERMINANTS	Definition and types of matrices
	Algebra of Matrices (addition, subtraction andscalar multiplication) problems
	Multiplication of Matrices(problems)
	Evaluation of 2x2 ,3x3 determinants and Singular matrices and problems in findingunknown variable
	Cramer's rule to solve system of linear equation with 2and 3 variables
	Cramer's rule to solve system of linear equation with 2and 3 variables.problems
	Minors, Cofactors of elements of square matrices oforder 2 and 3
	Adjoint of a square matrix(2x2 and 3x3),Inverse of anon singular square matrix
	Adjoint of a square matrix(2x2 and 3x3),Inverse of anon singular square matrix and problems
	Characteristic equation and eigen values of a 2x2 matirx and problems
2 STRAIGHTLINES	Slope of the straight line(provided with inclination andtwo points on the line as well) and problems
	Intercepts of a straight line and problems
	Intercept form of a straight line and problems
	Slope-intercept form of a straight line and problems
	Slope-point form of the straight line and problems
	Two-point form of a straight line and problems
	General form of a straight line.problems on findingslope and intercepts.
	Angle between two straight lines and conditions forthe lines to be parallel and perpendicular and problems
	Equation of a line parellel to the given line andproblems
	Equation of a line perpendicular to the givenline.problems

3 TRIGONOMETRY	Concept of angles and their measurement. Radian measures and related conversions (degree toradian and vice-versa) and problems
	Signs of trigonometric ratios in different quadrants(ASTC rule)
	Trigonometric ratios of allied angles (definition andthe table of trigonometric ratios of standard allied angles say $90^0 \pm \Theta$, $180^0 \pm \Theta$, $270^0 \pm \Theta$ and $360^0 \pm \Theta$)
	Problems on allied angles. (proving identities)
	Problems on allied angles. (Finding values of x in anidentity)
	Trigonometric ratios of compound angles (withoutproof)
	Trigonometric ratios of multiple angles (sin2A,cos2A, tan2A, sin3A, cos3A and tan3A)
	Problems on multiple angles sin2A, cos2A, tan2A,sin3A, cos3A and tan3A
	Transformation formulae (without proof) as sum toproduct. (Simple problems)
	Transformation formulae (without proof) as productto sum. (Simple problems)
4 DIFFERENTIAL CALCULUS ANDAPPLICATIONS	Definition of a derivative of a function. Listing the derivatives of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inverse trigonometric functions)
	Addition and subtraction rule of differentiation andproblems
	Product rule and quotient rule of differentiation andproblems
	Product rule and quotient rule of differentiation andproblems
	Composite functions and their derivatives. (CHAINRULE)
	Composite functions and their derivatives. (CHAINRULE). Problems
	Successive differentiation up to second order
	Slope of the tangent and normal to the given curve and their equations and problems

	Rate measure: velocity and acceleration at a point oftime and problems
	Local Maxima and Minima of a function
	Local Maxima and Minima of a function. Problems
5 INTEGRAL CALCULUS AND APPLICATIONS	Definition of an indefinite integral. Listing the Integrals of standard functions. (Algebraic, trigonometric, exponential, logarithmic and inversetrigonometric functions)
	Rules of Integration. Evaluation of integrals withsimple integrands and their combinations
	Rules of Integration. Evaluation of integrals with simple integrands and their combinations. Problems
	Evaluation of integrals with simple integrands andtheir combinations. Problems
	Evaluation of integrals by Substitution method
	Evaluation of integrals by Integration by parts
	Evaluation of integrals by Integration by parts.Problems
	Definition of definite integrals and their evaluation
	Evaluation of Definite integrals. Problems
	Area enclosed by the curves by integral method
	Volume generated by the curve rotated about an axisby integral method

Communication Skill

Preamble

Today, Communication is a very important skill for the success of every millennial student. Millennials affinity to use digital media for communication, changing career and working landscapes, and greater competition in colleges and workplaces makes enhancing student communication skillsbeyond language a must. Rote learning a few tips or tricks the night before an interview or performance review won't do the job if students are trying to make an impression in highly collaborative workplaces of the future. Expectations from students aspiring to be part of such future workplaces are that they have not just good verbal and non-verbal communication skills but also a good understanding of how to use modern tools for effective communication.

Scope

To enable students to communicate clearly and effectively, by improving their verbal and non-verbal communication skills, as well as enhancing interpersonal skills and knowledge of appropriate tools for specific communication strategies.

Course Objectives

The objectives of communication skills course are:

- Build better communication skills: oral and written expressions and body language
- Enable critical thinking
- Empower with active listening skills
- Enable team work/collaboration

Instructional Strategy

To achieve course objectives, it is important to provide the blended mode of instruction for each of the concepts. This blended mode of instruction enables and empowers students with:

- **Understanding of Concept (Theory):**
    - Through definitions, discussions, explanation, conclusions.
    - Through demonstrations: Show films or other workplace clips that model various conversation skills. This provides greater clarity of the concept by
        - Enabling observation skills
        - Helping in expression of gesture
        - building confidence
- **Application of Concept (Learning by doing):** It is imperative that to become a good communicator, the skills have to be built by applying the concept in the hypothetically created real life situations. Students are encouraged to participate in each of these activitiesduring lab session to help build the effective communication skills.
    - Use of technology tools like audio books, apps like voice thread or paper telephone, etc.
        - To help in workplace conversions.
        - To increase active listening, pronunciation
        - To help in voice modulation
    - Group discussion
        - Reinforce active listening
        - Enable group debate to imbibe healthy communication strategies
        - Sharpen the skills of "Asking clarifying questions"
        - Sharpen Feedback / Response skills
        - Time management skills
    - Group presentations/peer reviews
        - Enable team work

        - Assess concept understanding
        - Sharpen both oral and written communication skills
    - Group activities:
        - foster critical thinking
        - enable reflective learning
    - Tools usage:
        - Understand the difference between a Dictionary and a Thesaurus
        - Understand "When" and "How" to use these tools for communication

Course Outcomes

After completion of this course, the student shall be able to;

- Communicate
    - Identify audience (colleagues, management, customers/vendors)and use the right methodologies for communication using the right terminology, names, grades andother nomenclature pertaining to the trade, tools and specific equipment.
- Write
    - in at least one language correctly
    - basic level notes and observations
    - job cards, work sheets, basic report writing and responding to emails, simple presentations, job applications, resume
- Read
    - Technical manuals, task sheets/job orders, policies and regulations pertinent to thejob, including OEM guidelines.
    - all instructions given in memos, manuals, documents or those put up as posters across the premises
    - safety precautions mentioned in equipment manuals and panels to understand the potential risks associated
- Question
    - Ask right questions
    - Use different ways of asking questions
        - Clarifying/Open ended (What, Why, When, Who, Where, How)
        - Close ended
- Present
    - With right Posture & Gesture
    - With greater concept/content clarity
    - With high confidence
    - With voice modulation to capture the attention of audience
- Use technology tools
    - Office productivity
        - Word : Report writing
        - PowerPoint : Creating effective presentations
        - Excel : Data handling/Charts

Course Content

The following are the various units to be taught and assessed in order to ensure the student is ableto demonstrate the Course Outcomes mentioned in the **Course Outcome** section.

Pre-assessment:

Teachers are required to administer pre-assessment before starting the actual instruction. Thishelps in gathering information about students' like their attitude, beliefs, interests, and learningabilities.

Pre assessment expectations:

- To assess current language skill (Pronunciation, usage, sentence formation)
- To assess their ability to comprehend and respond to the instruction
- To assess their interest towards accepting ideas and learning
- To assess their current communication skills: asking questions, listening, communicatingwith confidence

UNIT 1: English – Introduction

Learning outcome:

Learn English pronunciation, functional grammar concepts& Reading. To gain confidence in spoken English.This section also covers phonemic awareness, grammar rules to set a strong base for application mode of communication.

Phonemic awareness	**Going over 42 sounds**	***Examining the understanding of sounds Spelling patterns (Consonant and Vowel blending: CVC words)*** ***Pronunciation*** o List of words given above (Commonly used words) o Diction (speech)	
Functional Grammar Concepts	**Revision of Grammar concepts**	***Parts of speech*** ***Sentence structure*** ***Examples of right sentences*** ***Gender, Singular, Plural*** ***Usage of voice (active and passive) and tenses***	
Comprehension activities	**Reading conversations (check the unit wise activity table)**	***Written test for each comprehension***	

UNIT 2: Communication

Lesson outcome:

At the end of the session:

- Students should be able to
  - Understand the communication process, influence of voice/tone, logical organization of thought, comprehension, listening skills.
  - Understand the basic building blocks of communication and strategies for workingwith each of these blocks.
  - Learn about carrying self, etiquettes of communication.
  - Build positive attitude about self and towards handling communication.
  - Learn the process for effective communication, problem solving techniques, to be confident communicator.

	What is communication? Why communication?		

INTRODUCTION:	**How do we communicate? Communication Theory and Process**		
	Barriers to communication	***How communication happens?*** • Pictorial representation of communication framework • Elements of communication: sender, receiver, message • Refer to activity in Unit activity section. ***Language*** • Lack of linguistic ability • Grammar ***Context*** • Psychology • Physiology ***Systematic*** • inefficient or inappropriate information systems • Lack of communication channel • lack of understanding of the roles and responsibilities ***Attitude*** • Perceptions • Preconceived notions	

Building blocks of communication	**People** **Message** **Context** **Listening**	***People:*** • Empathising with sender's or receiver's perception • Intent & Impact on the sender/receiver • Think – Feel – Do model ***Message:*** Message channels: o Inperson, **email**, memo, report Be aware of Mental Filters o Level of understanding/knowledge o Personal concerns o Pre conceived notions Organize message: o Critical thinking: organize your thoughts? Use following strategy: ▪ Who ▪ What ▪ When ▪ Why ▪ How o Bundle Primary and Secondary information o Mindful about non-verbal message o Tone of voice Examples of Types of messages: o Inform o Persuade o Cyclical Avoiding Miscommunication: • Evaluate (Checking for) understanding of the intent of the message with the receiver – by asking clarifying questions? ***Context:*** Define context Importance of context Tune into context • Timing • Location • Relationship	

		Listening: Importance of listening Barrier to listening: • Mental filters • Multitasking • Information overload Strategies for listening: • Recall • Acknowledge • Summarize • Listen with eyes for connecting to non-verbal connection • Empathize • Pay attention • Ask clarifying questions Effective Listening Behaviors: • Maintaining relaxed body posture • Leaning slightly forward if sitting • Facing person squarely at eye level • Maintaining an open posture • Maintaining appropriate distance • Offering simple acknowledgements • Reflecting meaning (paraphrase) • Reflecting emotions • Using eye contact • Providing non-distracting environment Behaviors that hinder effective listening • Acting distracted • Autobiographical (Telling your own story without acknowledging theirs first) • No response • Invalidating response, put downs • Interrupting • Criticizing • Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment	

UNIT 3: Verbal Communication

Lesson outcome:

At the end of this session, Students should be able to:

- Understand and define the communication framework structure for each of the verbal communication(in person/telephonic/video conference).
- Understand and apply the verbal communication techniques.
- Use technical jargons in communication.
- Use right body language during verbal communication
- Understand and practice the Active Listening techniques
- Confidently articulate or present the content

Different types of verbal communication:	***In person*** ***Telephonic*** ***Video conference***	Use ABC's : Accuracy, Brevity, Clarity ○ Introduction ○ Main body of the content ○ Summary • Use voice/tone effectively • Reinforcement of Listening skills: Active and Empathetic listening skills • Body language ○ Eye contact ○ Body posture ○ Gesture ○ Facial expression ○ Space	
Listening Skills	***Effective Listening behaviors***	Effective Listening Behaviours**:** • Maintaining relaxed body posture • Leaning slightly forward if sitting • Facing person squarely at eye level • Maintaining an open posture • Maintaining appropriate distance • Offering simple acknowledgements • Reflecting meaning (paraphrase) • Reflecting emotions • Using eye contact • Providing non-distracting environment	
	Behaviours that hinder effective listening	Behaviours that hinder effective listening • Acting distracted • Autobiographical (Telling your own story without acknowledging theirs first) • No response • Invalidating response, put downs • Interrupting • Criticizing • Judging • Giving advice/solutions • Changing the subject • Reassuring without acknowledgment	
Using technical Jargons:	*Assignment based project encouraging pupil to use the*		

	technical terms in the written and verbal communication. This requires understanding of the core concepts (from subject teacher) and integrating the concept with communication concepts to gain the real time application knowledge.		

UNIT4: Non-Verbal Communication:

Lesson outcome:

At the end of this unit, students should be able to:

- Understand the importance of Body language and its impact.
- Use the strategies for effective body language.
- Understand the relevance of different elements of emails and how to use them.
- Develop the confidence in presenting written content in logical and organized manner with a definitive email framework.
- Write different email formats confidently: Job application, Request email, apology email, email responses/feedback.
- Confidently write Resume/Curriculum-vitae, Reports, Formal letters and portfolio.

Body Language **Art of Professional writing:**	***Strategies*** ***Written communication*** ***Emails:*** • Structured framework for writing formal emails to emphasize on professional communication in English	Body language tips: • Keep appropriate distance • Take care of your appearance • Maintain eye contact • Smile genuinely Do's and Don'ts: dos: • smile • stand up confident and straight • use appropriate hand gestures • Make eye contact with audience • Hold neat note cards while presenting content Don'ts • point at anyone • rock backwards and forwards • pace across front of room • read off slides read off notes Different types of emails: Job application, request letter, letter writing and quick notes Structure of email text: • Introduction – Beginning of the letter and this plays crucial role as it provides first impression to the reader. o Who: author (name + position and organisation) o what: purpose - controlling idea (what author does or feels) • Development: Expand on the Controlling Idea/purpose of the email by answering relevant WH questions o what, when, where, who, whom, which, whose, why, and how • Conclusion: Positive words o Verb: thank, appreciate, hope, wish	

		o Phrases: be glad about, look forward to Email writing samples and practice contentin the activity section. Additional essential writing skills – Framework will be provided and assignments will be advised: • Resume writing /CurriculumVitae • Report Writing • Portfolio writing • Formal letters	
UNIT5: English - Reading Skills, Grammar & Vocabulary **Lesson Outcome:** At the end of the session, student should be able to: • Read sentences with punctuation. • Understand the techniques of reading complex words. • Understand and apply the reading techniques for efficient reading. • Understand the usage of communication tools like Thesaurus and Dictionary that aids in improving vocabulary and reading. • Understand and apply the functional grammar aspects in day today communication.			
	Comprehension activities ***Techniques for smart reading***	Passage comprehension Conversation comprehension Strategies for smart reading: • Skimming and scanning through the text, inferring the meaning • Questioning, summarizing	
	List of Commonly confused words and howto use/avoid them	Set of words to accelerate the English language learning and usage. Strategies to use these words effectively	
	Sentences: o Declarative sentence	Techniques of categorizing sentences, understanding how to build with punctuation and effectively use in the	

Reading skills **Functional Grammar** **Vocabulary**	○ Imperative sentence ○ Interrogative sentence ○ Exclamatory sentence ***Punctuation, Content organization and Comprehension*** ***Techniques:*** • Learning new words from comprehension by way of repetition and usage of these words in communication • Listing technical jargons and repeatedly using in the communication with peers and teachers • Chunking and reading words ***Tools*** • Understand the difference betweena Dictionary and a Thesaurus • Understand "When" and "How" to use these tools for communication	verbal and non-verbal communication. This involves more of hands on activities. Comprehension remains as a main activity to accelerate the learning of spoken and written English language Increases vocabulary, builds confidence and helps in becoming a good communicator. Activities are done, tips are provided to efficiently implement these strategies.	

Unit 6 - Communication Tools

Lesson Outcome:

At the end of the session, student should be able to:

- Use Email technology efficiently for communication
- Present content in the PPT format efficiently
- Understand different platforms available for web conferencing and efficiently work with them.
- Create reports and data management.

Introduction	Evolution of communication tools	Traditional vs. modern communication tools Advantages and Disadvantages	
One-to-One	***Email using Gmail***	How to use the tools effectively? Formatting, layout Including attachment Working with "To, CC, BCC" and Subjectfields effectively Using signature	
One-to-Many	***Presentation using PowerPoint***	Creating, Editing, Saving slides Using Animation Formatting options	
	Webinar / Web Presentation (zoom, Google meet, Skype)	Hosting online meeting using online meeting tools Inviting people Sharing screen	
Other	***Reports using MS Word***	Open, close, Edit and Save usage with documents Layout and strategies for creating report Sample report creation demo with follow on assignment Core subject project report submission assignment	
	Data & Graphs using MS Excel	Open, close, save and edit the excel document Creating data Using basic maths operation in Excel for working with data Creating simple graphs Assignment: For example, creating statisticsof subject wise activities completed for 6 months in the credit course	

Course Class Activity List (Unit-wise)

The following are the various activities that faculty could conduct for each unit are presented below;

Unit No.	Unit Title	Unit Activities
UNIT 1: Activities:	**English – Introduction**	1. 42 sounds revision:  1. s, a, t, i, p, n 2. c k, e, h, r, m, d 3. g, o, u, l, f, b 4. ai, j, oa, ie, ee, or 5. z, w, ng, v, oo, oo 6. y, x, ch, sh, th, th 7. qu, ou, oi, ue, er, ar • This helps in reducing the native language impact • Helps in understanding Short and Long vowel words • Helps in spelling • Helps in pronunciation 2. Reading commonly used words loud from the list (list will be provided in the workbook): • This helps in getting familiarity with the word pronunciation and helps in reading. 3. Blending words activity: • Write simple three letter words (CVC/CVCC/CVCV) pattern words: Can, Cap, Snap, cape (list will be provided in the workbook) • Show how to blend with the sound. • Starting with 3 letter words and continuing to 6 to 8 letter words. *Note: Remember before going through big words, it is always important to assess and ensure the student is aware of all the 42 sounds and are comfortable making small words.* Parts of Speech: building sentence using parts of speech: Demonstration by teacher: (Will be explained in the book as an example) Jumbled parts of speech: Student should pick the right orderto build meaningful sentence: (More samples will be provided in the workbook) • College go to youeveryday. • Makes spider web the a

		Gender, Singular and Plurals: • Match the following activity for singular and plural • Fill in the blanks activity for genders Reading & Comprehension: Conversation • Conversation at the bank (provided in the workbook along with few more conversation samples) • Questions based on this conversation will be provided in the workbook
Unit 2	**Communication**	Oral: • Introduce yourself? Visual: • Video clip on communication etiquette • Pictures (in addendum section): do's and don'ts of communication Group of students, one participant whispers in another participant's ear, and this message has to be passed on in a circle until it reaches back the sender. Making a noteof process of message conveyed and how it was perceived. o Identify the communication gap if any. o Discuss and conclude the communication framework importance o Discuss/reiterate how to make communication framework strong. 1. Role play to assess the understanding of building blocks of communication: (can be tapered to the core skills of diploma courses, following are just fewof the examples) a. Announcing the result of students in the class or b. Announcing the job placement of students (people, context, message, form of message) c. Discussing the guidelines of examination (listening skills) d. Listening to the weather forecast without seeing and making note of the listening

		ability (play video of weather forecast) – Assess based on how much the student is able to recall. 2. Run National geography/Discovery Video clip/subject related technical video clip on YouTube:Check: o if the student has not understood what a speaker expressed o about work or safety related issues o seeking clarification or advice appropriately from colleague, customer, management or vendor
Unit 3	**Verbal communication**	1. Voice/tone modulation: Showcase video Discussion: What was right? What was wrong? How it should have been better? 2. Picture description activity (memory test): Class split into groups A, B C,D: (two or four groups of at least 5 people each): Teacher shows different picture to each group for three minutes. Now each group has to remember what was on the picture anddiscuss with each other, write down the elements ona piece of sheet and share it with the teacher. Group that remembers more will be the winner. Teacher to observe the body language of a student inthe group, listening skills of a student, presentation skill, comprehension skill, content delivery skill, confidence level, team work. And reiterate the concepts, dos and don'ts, and discuss what could have been done better. (details of pictures will be given in the workbook) 3. Telephonic conversation: Role play by a teacher: Call Airtel/Vodafone department and asking for the phone numberportability process.

		After teacher demonstrates, teacher divides the class in to small groups of three people. • Each group will be given a different telephone conversation assignment (samples will be providedin workbook). • Two people in the group pretend to converse overthe phone, and the third person makes a note of right and wrong approaches during the communication.
Unit 4:	**Non-verbal communication**	Body language Simon Says: Instructions and set up : 1. Series of instructions to the group that are to be copied/reproduced. Start slowly and increase the pace 2. State the following actions as YOU do them: o Put your hand to your nose o Clap your hands o Stand up o Turn around o Touch your shoulder o Sit down o Stamp your foot o Cross your arms o Put your hand to your forehead – <u>BUT WHILE SAYING THIS PUT YOUR HAND TO YOUR NOSE</u> 3. Observe the number of group members who copy whatyou did rather than what you said. **Outcome of this activity:** Discuss how body language can reinforce/influence verbal communication and drive the importance of body languageand how to work on it • Email communication & Using technical jargons: Sample letter writing as assignment to students. (listwill be provided in the text book – Request, apology,

		job application and relevant email formats that are useful for students post diploma course) • There will be at least one assignment that utilizes technical jargons in email communication.
UNIT 5:	**English - Reading Skills, Grammar & Vocabulary**	• Reading passage (Provided in workbook) • Reading passage from the text book • Comprehension: Passage & Conversation (will be provided in workbook) • Chunking words and reading activities
Unit 6:	**Communication tools**	• Email writing activities: Writing emails using email provider. Theme based email writing • Report writing assignment Writing about a machinery tool/interior designing plan? Related to the diploma stream. • Resume writing assignment • Data handling: Collecting data about machines/number of students passed out of collegefor last three years and creating graph about it. • Presentation: o About learning in the communication class o Concept presentation

Course Assessment Strategies

Assessment Methodology

a. Observation (role play activities, team activities, demonstration)
b. Questions & Answer – Periodic Assessment

Assessment Grading RUBRICS

Language Basics	
Beginner	Doesn't know / understand
Intermediate	can read and identify commonly used words
Good	Confident , able to communicate well with known people
Advanced	Confident , able to communicate well with anyone using a English
Expert	Can read, understand; Also comprehend & can train others
Reading	
Beginner	Beginning to read, has native language impact
Intermediate	can read, identify words, build simple 3/4/5 letter words easily
Good	Can read, understand, build words, read simple sentences ; Also comprehend

Advanced	Can read, understand, build words, read simple sentences ; Also comprehend
Expert	Confident , read simple and complex sentences with punctuation, comprehend, spell also build words
Inter personal communication	
Beginner	is shy, doesn't talk/express
Intermediate	hesitates to communicate – due to lack of confidence / ability, can talkto known people
Good	can talk to unknown people, less confident, does not express, has hardtime working as a team
Advanced	can talk to unknown people, confident, can't express, has hard timeworking as a team
Expert	confident, can talk to anyone, express well, works well in the team
Body language	
Beginner	Is shy, not open to communicate, has hard time making friends
Intermediate	Knows basics of Body language, practices sometimes
Good	Knows basics of Body language, practices most times, has lessconfidence in presenting content
Advanced	Knows and practices good body language all times, can present content
Expert	Knows and practices good body language all times, is an example,Leads the pack to get better
Listening Skills	
Beginner	Just hears, no attention
Intermediate	Listens, pays attention, does not ask any question
Good	Listens, pays attention, ask questions
Advanced	listens, pays attention, asks questions, cannot empathize
Expert	Listens, pays attention, asks clarifying questions, able to understandthe message communicated
Acceptability to Learn	
Low	is not receiving to information
Average	receives information but resists to implement
Good , Above Average	receives information and implements per instructions
Strong	receives information and proactively implements and seeks feedback
Verbal Communication	
Beginner	Does not communicate, shy, low on confidence: has problem expressing in his/her native language or English language
Intermediate	Can communicate in native language, low confidence, shy, yet to try in English language
Good	Can communicate in native language, good confidence, tries to communicate in English language
Advanced	Can communicate in native language, express view points, good confidence, comfortable talking to people in the team, tries to communicate in English language aswell

Expert	Can communicate in native language, express view points, very good confidence, can communicate with anyone without any fear, asks clarifying questions, communicates well in English, or tries hard to communicate in English language as well
Non-Verbal Communication	
Beginner	Struggles to understand the non-verbal cues, has to work on body language, has hard time understanding the written communication aspects
Intermediate	Can understand the non-verbal cues, has to practice, tries to apply written communication aspects
Good	Can understand non-verbal cues, practices well, works hard to get hold on written communication skills, exhibits confidence in whatever task is given
Advanced	Can understand non-verbal cues, can work on written communication aspects, exhibits confidence, practices well, help others to identify non-verbal cues
Expert	Can understand non-verbal cues, train others, confident, exhibits good non-verbal cues at all times, can train the pack, has good hold on written communication as well.
Comprehension	
Beginner	Tries to read the passage, has hard time to comprehend
Intermediate	Can read the conversation passage, has hard time understanding the regular passage
Good	Can read the conversation passage, regular passage, but stutters in answering questions if there are technical jargons
Advanced	Can read the conversation passage, comprehend but regular passage comprehension is good
Expert	Can read the conversation passage, comprehend but regular passage comprehension is good, explain better to others, help others, lead the pack
Writing Communication	
Beginner	Has trouble forming right sentences for written communication
Intermediate	Can form sentences, has problem with the layout, gets confused between layout for different form of written communication
Good	Can form sentences, has fair understanding of the layout to be used for particular type of written communication, but stutters for words and expression
Advanced	Can form sentences, has good understanding of the layout to be usedfor particular type of written communication, confident, can express thoughts well
Expert	Can form sentences, has good understanding of the layout to be usedfor particular type of written communication, confident, can express thoughts well and train others and lead the pack

Recommended Learning Resources

https://www.englishclub.com/grammar/parts-of-speech.htm
Watch Amy Cuddy's TED Talk: Your Body Language Shapes Who You Are
Additional Reading: http://money.cnn.com/2000/05/03/career/q_body_language/

Pre-assessment:

Activity 1:
Make a group, read random words from the list, build sentence for few words from the list.

Create a group of 3 or 5 students. Randomly pick 5 words from the word list write down on the board/show them as a chart if you have created a word chart/make chit of words and ask them to pick one chit and READ the word.

Main idea: Testing the pronunciation ability, language ability, confidence in speaking, ability to understand and accept the instruction

Activity 2:
Simple reading test – Reading passages (Simple passage from the current course book)
Show the reading passage, let each one of them read 2 lines, after first student is done with reading two lines, then the next student must pick up from there and read next two lines. This process has to be followed until the entire class is done with reading or at least ten students are done with reading.

Main idea: Testing listening skills, attentiveness, language ability, pronunciation ability

Activity 3:
Students getting to know each other. Create a group of 3 or 5 students. Each student gets chance to talk to another student, introduce him/herself to the student, ask question, make a note of the answer against the name of the student who is answering the question on a sheet of paper.

Main idea: To assess current communication level, body language when students talk with each other, and confidence.

Commonly Used Word List

When	Today	For	Off		Yes	To	Girl	This	
Give	Stop	There	Often		On	Am	A	Could	
Again	Little	Than	Myself		Been	Where	You	Now	
Do	Large	At	Over		Of	Way	Be	Fun	
From	Both	Like	Along		He	Which	Were	Only	
Him	Name	Said	Why		It	Write	Or	Much	
Can	Few	They	Has		More	Goes	One	Tell	
Go	Home	Look	Bring		My	Great	All	Out	
But	Big	Know	Part		Any	Number		That	Fast
Old	Should	Done	By		Their	First	Cat	Is	
Not	Once	High	As		We	Find	His	Small	
Her	Thought		So	Into	She	Me	Have	Dog	
Time	Better	Them	Away		Did	In	How	See	
Long	Many	Does	No		Went	Before	Water	Here	
Had	Get	Always	Other		Full	Saw	And	People	
Word	Please	These	With		Some	Never	Use	School	
Very	Ask	Last	An		Then	Boy	Take	Two	
Your	Say	Got	What		If	Right	The	Call	
Make	Ten	Next	Come		Night	After	Will	Might	
Day	I	Those	Would		Made	About	Was	May	
Each	Show	Play	Who		Up	Far	Are	Walk	

To assess current communication skill: Activity based

Activity 3:

Making a group of students and getting to know each other with a predefined expectation for example:

Name:
I have performed on stage:
I'm good at sports:
I can speak more than 3 languages:
I'm always cheerful:
I like my mother tongue:

Computer Aided Engineering Drawing

1. COURSE RATIONALE:

Engineering Drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization.

2. LIST OF COMPETENCIES:

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

1. Prepare engineering drawings both manually and using CAD with given geometrical dimensions using prevailing drawing standards and draftinginstruments.
2. Visualize the shape of simple object from orthographic views and viceversa

3. COURSE OUT COMES:

CO1	Adopt the standards, dimensioning and construct appropriate drawing scales, in technical drawing development.
CO2	Visualize objects in all planes and learn displaying techniques for graphical communication in design process.
CO3	Sketch orthographic projections into isometric projections and vice versa.
CO4	Use computer software and Apply computer aided drafting tools to create 2D /3 D engineering drawings

5-a CONTENTS:

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

5-b COURSE CONTENT DETAILS:

Unit	Major Learning Topics and Sub- Topics	Outcomes (in cognitive domain)
UNIT-1 Basic elements of Drawing	1.1 List the different drawing instruments and application 1.2 Convention of lines and its application(Thick, Thin, Axis etc.,) 1.3 Practice use of drawing instruments 1.4 Representative fraction 1.5 Scales - Full Scale, Reduced Scale and Enlarged Scale 1.6 Dimensioning a. Aligned system and Unidirectional system in the Sketches b. Chain dimensioning and Parallel dimensioning 1.7 Construct different polygons	1. Drawing equipments, instruments and materials. 2. Equipments-types, specifications, method to use them,applications. 3. Instruments-types, specifications, methods to use them andapplications. 4. Pencils-grades, applications, Different types oflines. 5. Scaling technique used indrawing. 6. Dimensioningmethods.-Alignedmethod. Unilateral with chain, paralleldimensioning. 7. Constructions of geometrical figures
UNIT-2 Introduction to Projections	2.1 Introduction to Projections-Principle Planes of Projection and Principle Views 2.2 Introduction to First angle and Third angle method, their symbols 2.3 Projection of points in All 4 Quadrants	1. Reference planes, orthographicprojections. 2. Concept ofquadrant,1st angle and 3rd angle projection andtheir symbols. 3. Projection ofpoints.
	2.4 Projection of Lines a) Parallel to both the planes b) Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another	1. Projection of lines determination of true length and inclinations for followingcases. (a) Line parallel to one or both theplane. (b) Line perpendicular to one of theplane. (c) Line inclined to one plane and parallel to another.
	2.5 Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two b) Planes Perpendicular to one plane and inclined to the other (Resting on Edge, Corner, Inclined to HP And VP)	1. Projection ofPlanes. (a) Types ofplanes. (b) Projection of planes parallel to one of the referenceplanes. (c) Projection of plane inclined to one reference plane and perpendicular toanother. Note : *Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems*.

	2.6 Projection of Solids for the above conditions	1. Projections of solids in various positions with respect to the reference planes. (Parallel, perpendicular and inclined to HP and / or VP.)
UNIT-3 Orthographic projections	3.1 Introduction to orthographic, Perspective, Isometric and Oblique projections 3.2 Conversion of pictorial view into Orthographic Views	1. Types of projections-orthographic, perspective, isometric and oblique: concept andapplications. 2 Various term associated with orthographic projections. (a) Theory ofprojection. (b) Methods ofprojection. (c) Orthographicprojection. (d) Planes of projection. 3. Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection. Note : (1) Problem should be restricted up to - Front view/Elevation, Top view/Plan and Side views only. Use First Angle Method only.
UNIT-4 Isometric projections	4.1 Introduction to Isometric Projections 4.2 Isometric Scales and Natural Scale 4.3 Isometric View and Isometric Projection 4.4 Conversion of Orthographic Views into Isometric	1. Isometric axis, lines andplanes. 2. Isometricscales. 3. Isometric view and isometricdrawing. 4. Difference between isometric projection and isometricdrawing. 5. Illustrative problems limited to Simple elements
UNIT- 5	5.1 Introduction to CAD- Hardware requirements. 5.2 Various CAD software available 5.3 Familiarization of CAD window - Commands like New file, Saving the file, Opening an existing drawing file, Creating templates 5.4 Setting up new drawing: Units, Limits, Grid, Snap. Standard sizes of sheet. 5.5 Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview 5.6 Draw basic entities like Line, Circle,	1. Computer graphics & its terminology. 2. CAD definition, concept & need. 3. Commands used in CAD 4. Functional areas of CAD. - Coordinate systems. 5. Familiarization of Cad commands 6. Draw simple Geometrical figures using CAD

	Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text Applying constraints - horizontal, vertical, parallel, concentric, perpendicular, symmetric equal, collinear 5.7 Insert title block for the drawing and take the Print out 5.8 Create objects by applying constraints and convert the objects to full scale , reduced scale and enlarged scale 5.9 Apply copy, mirroring, array, fillet and trim on the object created	
UNIT-6 CAD Drafting	6.1 Draw different types of 2D/3D modeling entities using viewing commands, to view them (Problems solved in chapter no 3 and 4 i.e Orthographic, isometric projection). 6.2 2D/3D modeling for Threadprofiles,nuts,bolts,studs,setscrews,washer,Locking arrangements	1 Difference between 2D & 3D models. 2.2D/3D modeling – concept, Simple objects
		TOTAL

6.LIST OF PRACTICAL EXERCISES:

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sl. No	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)
1	1	1. Teacher will demonstrate a: Use of a. Drawinginstruments. b. Planning and layout as per IS. c: Scaling technique.
		2. Drawfollowing. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter.(Drawing sheet)
		Problem – 2 Indicate different convention of lines on the drawing. .(Drawing sheet)
		Problem – 3 Copy the sketch to the required scale and dimensioning adopting right system and positioning of dimensions using Tee and Set squares / drafter.(Drawing sheet)
		Problem 4. Draw regular geometric constructions Pentagon, Hexagon, Square, circle, Triangle and other shapes. .(Drawing sheet)

2	2	First angle Projection symbol Problem 5: Draw Projection of points in 1^{s} , 2nd ,3 ^{d} and 4 Quadrants.(Drawing sheet)
		Problem 6: Draw Projection of Lines a) Parallel to both the planes b)Parallel to one and Perpendicular to another c) Parallel to one and Inclined to another. .(Drawing sheet)
		Problem 7: Draw Projection of plane surfaces. a) Parallel to one plane and Perpendicular to other two(Resting on Edge, Corner, Inclined to HP And VP)
		Problem 8: Planes Perpendicular to one plane and inclined tothe other (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheets)
2	2	Problem 9: Draw Projection of Solids for the above conditions (Resting on Edge, Corner, Inclined to HP And VP) (Drawing sheet)
3	3	Problem 10: Draw Orthographic views for the given object. (Sketch book and CAD Drawing)
4	4	Problem 11: Draw Isometric projections for the given Orthographic views (Sketch book and CAD Drawing)
5	5	Use of CAD commands , plotting the drawing
		Problem 12:Drawing basic entities : Circle, Arc, Polygon, Ellipse, Rectangle, Multiline
		Applying constrains draw basic entities Insert title Block (CAD Drawings and Printout)
6	6	Problem 13:Produce Orthographic (2D) Drawings in CAD-Chap3 Problem 14:Produce Isometric and 3D Drawings in CAD – Chap 4(CAD Drawings and Printout)
		Problem 15:create 3D models of Mechanical Elements such as Hexagonal headed bolt, Simple toy, ball bearing (CAD Drawings and Printout)
		TOTAL

Note:Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.

1 Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.
2 The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.
3 The sketchbook has to contain data of all problems, solutions of all problems and student activities performed.
4 Students' activities are compulsory to be performed. A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.
5 For 40 marks Practical Marks ESE, students are to be assessed for competencies achieved.

7.SUGGESTED LIST OF STUDENT ACTIVITIES:

SL.NO.	ACTIVITY
1	Sketch the combinations of set squares to draw angles in step of 15^0.(15^0, 30^0, 45^0, 60^0, 75^0, 90^0, 105^0, 120^0, 135^0, 150^0, 165^0, 180^0).
2	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
3	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
4	List at least two questions individually which you would like to ask for followings:
5	Prepare a 2D drawing using AutoCAD and 2D parametric sketcher environment.
6	Prepare 3D solid models using AutoCAD any on e mechanical component (Four components).

8. SUGGESTED LEARNING RESOURCES:

1. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.
2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93-80358-17-8.
3. Jain &Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978- 93-86173-478)
4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1
5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-219-1431-0.
6. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.
7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD* . PHI Learning Private Limited-New Delhi (2010); ISBN: 978-8120337831.
8. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas Publishing HousePvt. Ltd, Noida, 2011; ISBN: 978-8125953005.
9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.
10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers* .Dreamtech Press; Galgotia Publication, New Delhi, 2015; ISBN 978-9351199113.

9.SOFTWARE/LEARNING WEBSITES :

1. https://www.youtube.com/watch?v=TJ4jGyDWCw
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. https://www.youtube.com/watch?v=_MQScnLXL0M
4. https://www.youtube.com/watch?v=3WXPanCq9LI
5. https://www.youtube.com/watch?v=fvjk7PlxAuo
6. http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf
7. https://www.machinedesignonline.com

Mining Geology-I

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

SHOP	Unit skill set (In cognitive domain)	Topics/Sub topics
UNIT-1 Introduction to Geology	1. Know the scope of Geology. 2. Know the zones of Earth. 3. Understand weathering and erosion.	1. Scope of Geology-its importance and interest. 2. Branches of geology – Physical geology, Mineralogy, Structural geology, Petrology, Economic geology, Stratigraphy, Engineering geology & Hydrogeology 3. The internal constitution of the Earth; Barysphere, Lithosphere, Hydrosphere, Atmosphere, Pyrospere, Asthenosphere and Techno sphere. 4. Weathering and Erosion. 5. Weathering-Mechanical and Chemical. 6. Erosion- Wind, Fluvial, Marine, and Glacial erosion.
UNIT-2 Applied Mineralogy	1. Understand the Origin and Occurrence of Mineral 2. Identify the different physical properties of Rock forming minerals.	1. Origin and Occurrence of Mineral. 2. Physical properties of Minerals 3. Physical properties of the following minerals –Quartz, Calcite, Gypsum, Fluorite, Barite, Beryl, Magnesite, Kyanite, Feldspar: Orthoclase, Microcline, Hornblende, Mica-Muscovite, Biotite, Talc, Augite, Corundum, Calcite, Magnesite,

UNIT-3 Petrology a) Igneous formations	1. Understand the concepts of Petrology-Igneous Formations. 2. Identify the textures and structures of Igneous rocks 3. Identify the igneous rocks.	1. Classification of rocks into Igneous, Sedimentary and Metamorphic rocks 2. Textures of igneous rocks: 3. Equigranular, -PanidiomorphicHypidiomorphic andAllotriomorphicInequigranular textures-Porphyritic, Poikilitic and intergrowth textures 4. Structures of Igneous rocks- 5. Forms of Igneous rocks: Concordant and Discordant Igneous Intrusions-Sill, Dyke and Batholith 6. Classification of the Igneous rocks based on Depth of Formation-Plutonic, Hypabyssal and Volcanic rocks based on percentage of Silica-Acid, Intermediate, Basic and Ultra basic. 7. Study of the following Rocks-Granite, Diorite, Syenite, Dunite, Dolerite, Granite porphery, Syenite porphery, Dolerite porphery, Pegmatite and Basalt.
UNIT-4 b)Sedimentary and Metamorphic formations	1. Understand the concepts of Petrology-Sedimentary and	1. Sedimentary Rocks and its formation: Mechanically, chemically and organically. 2. Textures of Sedimentary rocks 3. Structures of Sedimentary Rocks.
	Metamorphic Formations. 2. Identify the sedimentary and metamorphic rocks.	4. Classification of Sedimentary rocks- Rudacious, Araneceous, Calcarious and Argillaceous 5. Description of the following Sedimentary Rocks-Conglomerate, Breccia, Sand stone, Grit, Lime stone, Dolomite and Shale 6. Metamorphism and Metamorphic Rocks. 7. Agents of Metamorphism 8. Explain the different types of Metamorphism 9. Classification of the Metamorphic Rocks into-Foliated and Massive Rocks. 10. Study of important metamorphic rocks-Gneiss, Schist, Marble, Slate, Quartzite,

Practical Exercises

1. Demonstration of branches of geology with charts.
2. Different zones of the earth Barysphere, Lithosphere, Hydrosphere, Atmosphere, Pyrospere, Asthenosphere and Techno sphere.
3. Demonstration of Weathering and Erosion with internet videos.
4. Weathering-Mechanical and Chemical.
5. Study of Marine, and Glacial erosion.
6. Study of Erosion- Wind, Fluvial.
7. Study of different properties of Minerals using internet videos.
8. Habit, colour, streak, lustre, diaphinity, cleavage, fracture, specific gravity.
9. Identification of physical properties of the following minerals-different types of Quartz, Calcite.
10. Identification of physical properties of the following minerals Gypsum, Fluroite, Barite.
11. Identification of physical properties of the following minerals Beryl, Magnesite, Kyanite, Mica-Muscovite, Biotite, Talc.
12. Identification of physical properties of the following minerals Hornblende, Feldspar: Orthoclase and Microcline.
13. Identification of physical properties of the following minerals Talc, Augite, Corundum, Magnesite.
14. Study of classification of Rocks.
15. Demonstration of Concordant and Discordant Igneous Intrusions- Sill, Dyke and Batholith.
16. Study of Texture and its types- Equigranular,- Panidiomorphic Hypidiomorphic and Allotriomorphic.
17. Ineequigranular Textures-Porphyritic, Poikilitic and intergrowth textures.
18. Study of structures of Igneous Rocks-Vesicular and Amygdaloidal.
19. Identification of the following Rocks-Granite,Syenite, Dunite.
20. Identification of Identification of the following Rocks Granite Porphery, Syenite porphery, Dolerite, Dolerite porphery, Diorite, Pegmatite and Basalt.
21. Study of textures and structures of Sedimentary.
22. Study of textures and structures of Metamorphic.
23. Identification of the following Sedimentary Rocks- Conglomerate, Breccia, Sand Stone, Grit, Lime Stone and Shale.
24. Identification of the following Metamorphic Rocks- Gneiss, Schist, Marble, Slate, Quartzite.

SUGGESTED LEARNING RESOURCES:

1. A Text book of Geology: P.K Mukerjee
2. Rutley's elements of Mineralogy: H.H.Read
3. Principles of petrology –G.W. Tyrell.
4. Fundamentals of Engineering Geology-R.S.Khurmi
5. Engineering Geology- Vasudev Kanithi

(2nd – SEMESTER)

Project Management Skills

Subject Code – SEC201

RATIONALE

Project Management is a confluence of Management principles and Engineering subject area. This course enables the students to develop conceptualization of Engineering Management principles and apply the same for their engineering projects, in their domains, example, Software Development project or Construction Project and so on. The course integrates three core areas of Planning, Execution and Auditing of Projects.

1. COURSE SKILL SET

Student will be able to:

1. Understand what constitutes a project, Plan for the execution of the project bybreaking into manageable work units, and Prepare necessary project artifacts
2. Track and control the Project while preparing verifiable records for Project Inspections and Audits
3. Inspect and Audit projects for Milestones or other project completion criteria andother metrics, Defects and remediation, Project learnings
4. Gain knowledge and develop curiosity on latest technology trends in Project management.

2. COURSE OUT COMES

At the end of the course, student will be able to

CO1	Apply the concepts of Project Management to real projects which are expressedin the form of the Project reports or Engineering drawings
CO2	Estimate Project resources needed Time, Material and Effort, and Plan for Execution
CO3	Understand, analyse and assess the risks involved in a project and plan formanaging them
CO4	Use Project Management Software and processes to track and control Projects
CO5	Conduct inspection of Projects and audit progress and bills
CO6	Understand the Digital Technology trends in Project management and conceptslike Smart cities

3. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS

UNIT NO	UNIT TITLE	TEACHING HOURS (L-T-P)	MARKS DISTRIBUTION(THEORY)			
			R LEVEL	U LEVEL	A LEVEL	TOTAL
1	Introduction	02-00-04	8	8	4	20
2	Project Administration	06-00-12	8	12	20	40
3	Project Lifecycle	04-00-08	8	12	20	40
4	Project Planning, Scheduling and Monitoring	06-00-12	8	12	20	40
5	Project Control, Review and Audit	06-00-12	8	12	20	40
6	Digital Project Management	02-00-04	8	8	4	20
	Total	26-00-52=78	**48**	**64**	**88**	**200**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

4. DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill setsfor achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics / Subtopics
1 Introduction	Use Basic Science, Maths skills to understand Project management and project planning, execution and control.	Introduction and definition, Features of a Project, Types of Projects, Benefits and Obstaclesin Project Management, Project Management Profession, Role of Project manager, Consultants, Project and Operation, Project Management Process, Project Scope

2 Project Administration	Able to develop WBS, PEP and PM processes for Project with given inputs	Project Administration, Project Team, Project Design, Work Breakdown Structure (WBS), Project Execution Plan (PEP), Systems and Procedure Plan, Project Direction, Communication and Co-ordination, Project Success Case Study I
3 Project Lifecycle	Use project administration and project lifecycle knowledge to Assess and plan for project risk	Project Life Cycle, Phases - Project Planning, Project Execution, Project Closure, Project Risks, Project Cost Risk Analysis, Time and Cost overruns Case Study 2a
4. Project Planning, Project Scheduling and Project Monitoring and Implementation	Able to develop a detailed project plan given the inputs on manpower, funds availability and time availability	Project Planning Function, Structure, Project Scheduling, Project monitoring and Project evaluation Case Study 2b
5.Project Control, Review and Audit	Use Project Management lifecycle knowledge to Control project parameters, review and audit project performance	Project Control, Problems of Project Control, Gantt Charts, Milestone Charts, Critical Path Method (CPM), Network Technique in Project Scheduling, Crashing Project Duration through Network, Project Review, Initial Review, Performance Evaluation,
		Abandonment Analysis, Project Audit Case Study 2c
6.Digital Project Management	Understand latest trendsof digital technologies impacting the domain of project management and application of the same in multiple scenario	Digital Technology trends in Project management, Cloud Technology, IoT, Smart cities, Data and analytics, case studies Case study 3

8. SUGGESTED LEARNING RESOURCES:

SlNo.	Author	Title of Books	Publication/Year
1	**Dr. Lalitha Balakrishnan & Dr. Gowri Ramachandran**	**Project Management**	**Himalaya Publishing, 2019**
2	Shailesh Kumar Shivakumar	Complete Guide to Digital Project Management	Apress, 2019
3	Prasanna Chandra	Project planning, analysis, selection, implementation and review	Tata McGraw Hill
4	Gopala Krishnan	Project Management	Mcmillan India Ltd.

10 DETAILED COURSE CONTENT

Unit No And Name	DETAILED COURSE CONTENT	CONTAC THRS	TOTAL
	1.1 Introduction	3	
Unit No And Name	**DETAILED COURSE CONTENT**	**CONTAC THRS**	**TOTAL**
1. Introduction	1.2 Meaning of Project		
	1.3 Definition and No Change Mode		
	1.4 Features of a Project		
	1.5 Types of Projects		
	1.6 Benefits of Project Management		
	1.7 Obstacles in Project Management		
	1.8 Project Management A Profession		
	1.9 Project Manager and His Role		
	1.10 Project Consultants		
	1.11 What is Operation?		
	1.12 Difference between Project and Operation		

	1.13 What is Process in Project Management and Process Groups?		
	1.14 What is Scope? Difference between Project Group Objectives and		
	1.15 Project Scope		
2. Project Administration	2.1 Essentials of Project Administration		
	2.2 Project Team		
	2.3 Project Design		
	2.4 Work Breakdown Structure (WBS)		
	2.5 Project Execution Plan (PEP)		
	2.6 Contracting Plan		
	2.7 Work Packing Plan		
	2.8 Organisation Plan		
	2.9 Systems and Procedure Plan		
	2.10 Project Procedure Manual		
	2.11 Project Diary		
	2.12 Project Execution System		
	2.13 Project Direction		
	2.14 Communication in a Project		
	2.15 Project Co-ordination		
	2.16 Pre-requisites for Successful Project Implementation		
3. Project Lifecycle	3.1 Introduction		
	3.2 Phases of Project Life Cycle		
	3.3 Project Management Life Cycle General		
	3.4 Project Planning		
	3.5 Project Execution		
	3.6 Project Closure		
	3.7 Project Risks		
	3.8 Types of Risks: Illustrations		
	3.9 Risk Assessment Techniques with Illustrations		
	3.10 Project Cost Risk Analysis		
	3.11 Estimating Time and Cost Overrun Risks		
	3.12 Organisation/Procedural/Systemic Reasonsfor Project Cost Overruns		
	3.13 Time Overruns		

4. Project Planning, Scheduling and Monitoring	4.1 Introduction		
	4.2 Nature of Project Planning		
	4.3 Need for Project Planning		
	4.4 Functions of Project Planning		
	4.5 Steps in Project Planning		
	4.6 Project Planning Structure		
	4.7 Project Objectives and Policies		
	4.8 Tools of Project Planning		
	4.9 Project Scheduling		
	4.10 Time Monitoring Efforts		
	4.11 Bounding Schedules		
	4.12 Scheduling to Match Availability of Manpower		
	4.13 Scheduling to Match Release of Funds		
	4.14 Problems in Scheduling Real-life Projects		
	4.15 Introduction		
	4.16 Situation Analysis and Problem Definition		
	4.17 Setting Goals and Objectives		
	4.18 Generating Structures and Strategies		
	4.19 Implementation		
	4.20 What is Project Evaluation?		
	4.21 Why is Project Evaluation Important?		
	4.22 What are the Challenges in Monitoring and Evaluation?		
5. Project Control, Review and Audit	5.1 Introduction		
	5.2 Projected Control Purposes		
	5.3 Problems of Project Control		
	5.4 Gantt Charts		
	5.5 Milestone Charts		

	5.6 Critical Path Method (CPM)		
	5.7 Construction of a Network		
	5.8 Network Technique in Project Scheduling		
	5.9 Crashing Project Duration through Network		
	5.10 Project Review		
	5.11 Initial Review		
	5.12 Post Audit		
	5.13 Performance Evaluation		
	5.14 Abandonment Analysis		
	5.15 Objectives of Project Audit		
	5.16 Functions of Project Auditor		
	5.17 Project Audit Programme		
	5.18 Difficulties in Establishing Audit Purpose and Scope		
6. Digital Project Management	6.1 Digital Technology trends in Project management		
	6.2 Cloud Technology, IoT, AR and VR applicationsin Project management, Smart Cities		
	6.3 Data Science and Analytics in Project Management		
	6.4 Case Studies		

Case Studies:

Please note: The Tutors can either use the following Case studies and activities or Designon their own, with the overall Learning Outcomes being met.

Case Study I: Residential House – Project Execution Plan

1. Dr. Sunil Kulkarni wants to build a house on his 9000 square feet (90x100) vacant plotin Bengaluru. His requirements were given below.

    i) He lives with his wife, parents and two college going children.
    ii) He likes open space around his house and likes to do gardening during free time
    iii) His wife teaches Yoga and about 30 middle aged and old people attend the daily sessions.
    iv) He has a budget limitation of INR 230,00,000 for this project and wants to

present to his wife on their 20th wedding anniversary which is 18 months away.

v) His parents can not climb stairs and hence prefer a ground floor room

vi) All the rooms should have attached bathrooms

How-ever the Civil contractor who took the work, overshot the time and money availableand hence Dr Sunil was unhappy with the Architect firm who recommended the Contractor.

Task:

- Split the class into groups of three
- Ask them to prepare 2D drawings with Plan, Elevation, Sections and perspectives.
- Prepare the detailed WBS, a Project execution plan and Project communication planfor contractors
- Estimate the quantities
- Discuss on the possible reasons for delay and methods with which performance toboth time and budget could have been achieved
- Present it in a seminar, with each group getting 5-10 minutes to present their idea.

Case Study 2a:

The Columbus Hospital proposed in Hubli is a 200 bed speciality private hospital for treatment of Cancer. The hospital will come up on a 12 acre plot between Hubli-Dharwad. A leading construction company has come forward to complete the hospital works from concept to commissioning in 9 months. The promoters are willing to spend a premium to complete the hospital in 9 month time and are not particular about type of construction, ie, RCC, Steel frame etc. The key requirements are as follows:

i) 200 bed hospital of which 40 are for critical care (ICU), 40 for pre and post Operative care

ii) 4 Operation Theatres - 2 Major (Minimum 800 SFT each) and 2 minor (minimum400 sft each)

iii) One full fledged Diagnostic laboratory (1500 Sft)

iv) One 24x7 pharmacy (360 Sft min)

v) Doctors rooms, Nurses enclosures, Change rooms

vi) Office with billing counters (min 2000 sft) for all administrative staff

vii) Wheel chair parking bays, Stretcher parking bays in all floors

viii) One Cafetaria with 50 person capacity

ix) One conference room with Multimedia equipment (300 sft min)

x) Parking for ambulances, 4 wheelers, two wheelers

xi) Reception and enquiry counter

xii) All amenities should be accessible for disabled persons

xiii) Incinerator, Waste storage and disposal area

xiv) Generator and fuel storage area

Discuss

i) The various alternative approaches available to complete the hospital.
ii) Look into National Building Code and BIS standards for arriving at approximate(+/-10%) super built-up area required, amenities to be planned
iii) The various phases of the project according to Project lifecycle and durations
iv) Prepare the detailed WBS, Project Organisation required and Project Dairytemplate
v) Prepare a Project Plan with risks involved and the risk management plan.
vi) Estimate the cost of time overrun if the project is delayed by 114 calendar daysdue to issues with approvals

Case Study 2b:

For case study 2 above, prepare an Implementation Plan using a spreadsheet software.

Discuss

i) What happens if a pandemic affects the project in its 7^{th} Month. How do you mitigate the possible issues in implementation?
ii) What happens if during the fourth month of projects the client decides to reducefunds for the month by 50% ?

Case Study 2c:

For case study 2 above, prepare a Critical Path method Chart (CPM) showing all main activities in the WBS with milestones.

Discuss

i) What happens if the client decides to complete the ground floor roof 15 days earlier ?
ii) What happens if the client reduces the inflow of project funds by 50% for the month 4 ?
iii) Write an Audit report for the project at the end of 6^{th} month

Case Study 3:

This will be done as a student activity and has two components.

i) Research on 3D printing in any industry and prepare a three page article
ii) Study usage of Drones in different Industries and evaluate the Cost benefits of using the same for any one scenario.

STATISTICS AND ANALYTICS

Subject Code – AEC201

RATIONALE

Statistics and analytics help the learner to use the proper methods to collect the data, employ the correct analyses, effectively present the results and conduct research, to be able to read and evaluate journal articles, to further develop critical thinking and analytic skills, to act as an informed consumer and to know when you need to hire outside statistical help. The python language is one of the most accessible programming languages available because it has simplified syntax and not complicated, which gives more emphasis on natural language.

COURSE OUT COMES

At the end of the course, student will be able to

CO1	Understand the tools of data collection, classification and cleaning of data.
CO2	Able to summarize the given statistical data
CO3	Understand the measure of location and dispersion of data.
CO4	Learn the basics of Python programming.

DETAILS OF COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit SkillSets for achieving CO to attain identified skill sets.

UNIT NO	Unit skill set (In cognitive domain)	Topics/Subtopics
UNIT-1 **STATISTICAL DATA COLLECTION ANDTYPES**	➢ Able to collect statistical data. ➢ Able to distinguish the data types. ➢ Understands the usage of data collection tools ➢ Able to specify problem statement for data collection ➢ Able to collect data pointing the root cause of the problem statement.	a Definition of data and classification (qualitative quantitative discrete and continuous data). b Data collection tools iv) Questionnaires. v) Survey. vi) Interviews. vii) Focus group discussion. 1.3 Data cleaning.
UNIT-2 **SUMMARIZATI ONOF DATA**	➢ Sketches bar, pie and histograms on Microsoft Excel spread sheet. ➢ Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet. ➢ Sketches bar, pie and histograms on Microsoft Excel spread sheet. ➢ Sketches frequency curve and frequency polygon for the data set on Microsoft Excel spread sheet.	a Descriptive statistics viii) Datatabulation(frequencytable ix) Relative frequency table. b Grouped data x) Bar graph xi) Pie chart xii) Line graph xiii) Frequency polygon xiv) Frequency curve xv) Relative frequency polygon xvi) Histograms xvii) Box plot xviii) Leaf-stem plot To be done in Microsoft excel.
UNIT-3 **MEASURE OF LOCATION AND DISPERSION**	➢ Able to determine the descriptive statistical variables using Microsoft Excel.	a Determination of central tendencies Range, Mean, Mode and Median for the data in Microsoft excel. b Determination of absolute

	➢ Able to determine the absolute measures of dispersion of the given data set. ➢ Explain the symmetry and asymmetry of the distributed data.	measures of dispersion for data like range quartile deviation, mean deviation, standard deviation and variance in Microsoft Excel. c Skewness and kurtosis graphs in Microsoft excel and interpretations of results.
UNIT-4 **INTRODUCTION TO** **PYTHON** **PROGRAMMING**	➢ Able Install and run the Python interpreter. Create and execute Python programs. ➢ Understand the concepts of file I/O. ➢ Able to read data from a text file using Python. ➢ Learn variable declarations in Python. ➢ Learn control structures. ➢ Learn loop constructs.	4.1 Introduction to PYTHON. 4.2 Syntax of PYTHON. 4.3 Comments of PYTHON. 4.4 Data types of PYTHON. 4.5 Variables of PYTHON. 4.6 If-else in PYTHON. 4.6 Loops in PYTHON. 4.7 Arrays and functions in PYTHON.

SL NO	Practical outcomes/Practical exercises
1	Prepare a questionnaire (closed end) containing 25 questions for a specified problem statement: for example experience of an individual in a restaurant.
2	Prepare a Google form for a specified problem statementto collect the dataset. (for example questionnaire to conduct online quiz)
3	Send out a survey on your problem statement to numberof 50 (By Google forms) and collect the data.
4	Remove duplicate or irrelevant observations. Remove unwanted observations from the dataset provided, including duplicate observations or irrelevant observations.
5	In Microsoft Excel spread sheet draw the frequency distribution table for the given data (data set should contain minimum 50 data).
6	In Microsoft Excel spread sheet draw the relative frequency distribution table for the given data (data set should contain minimum 50 data).
7	Using Microsoft Excel spread sheet plot bar graph for the data collected from 100 people(for example, conduct a survey on the favorite fruit of a person in your locality(restricting to 5 to 6 fruits). Explain the bar graph with minimum 30 words.
8	Using Microsoft Excel spread sheet plot pie chart for the data collected from 50 people(for example, conduct a survey on the smokers with respect to their ages in your locality. Explain the pie chart with minimum 30 words.
9	Using Microsoft Excel spread sheet draw a line graph for the given dataset.
10	Using Microsoft Excel spread sheet draw frequency polygon and frequency curve for the data collected from 50 people. (For example, marks obtained by the studentsin your class in 5 subjects in previous examination). Explain your observations from the graph in minimum 30 words.
11	Using Microsoft Excel spread sheet construct a box plot for the given dataset. (For example dataset can be the number of passengers in a flat form at different time in a day).
12	Using Microsoft Excel spread sheet construct a leaf plot for the given dataset. Explain the graph with minimum 30 words.

13	Using Microsoft Excel spread sheet find the Mean, Mode and Median for the data (univariate data) given and alsorepresent them in a Histogram.
14	Generate a 50 random data sample (even and odd number dataset) using Microsoft Excel spread sheetand determine the range and Quartiles.
15	Collect the current yield of a crop from 50 different persons (problem statement can be changed according to priorities of the tutor) in your locality and determinemean deviation and Quartile deviation in Microsoft excel spread sheet and brief your inference with lessthan 30 words.
16	Collect the data of any 2 livestock population from 50 different houses in your locality (problem statement can be changed according to priorities of the tutor) anddetermine standard deviation for both the two separately in Microsoft excel spread sheet and briefyour inference with less than 30 words.
17	Collect the data of two wheeler (with a rider and a pillion) crossing a busy junction in your locality in the peak hours (problem statement can be changed according to priorities of the tutor) and determine the variance of the data in Microsoft excel spread sheet and brief your inference with less than 30 words.
18	Using Microsoft Excel spread sheet draw a Skewnessgraph and kurtosis graph for randomly generated dataset.
20	Write a python program to add 2 integers and 2 stringsand print the result.
21	Write a python program to find the sum of first 10natural numbers.
22	Write a python program to find whether the number is odd or even.
23	Write a python program to find the variance andstandard deviation for the given data..
24	Write a python program to display student marks fromthe record.
25	Write a python program to create a labeled bar graphusing matpoltlib. pyplot.
26	Write a python program to create a labeled pie chart using matpoltlib. pyplot.

SUGGESTED LEARNING RESOURCES:

1. Statistical Analysis with Excel For Dummies (For Dummies Series) Paperback Import, 9 April 2013 by Joseph Schmuller (Author)
2. https://www.brianheinold.net/python/A_Practical_Introduction_to_Python_ProgrammingHeinold.pdf
3. http://www.bikeprof.com/uploads/9/0/6/5/9065192/excel_stats_handout_npl.pdf
4. https://adminfinance.umw.edu/tess/files/2013/06/Excel-Manual1.pdf
5. https://www.brianheinold.net/python/A_Practical_Introduction_to_Python_ProgrammingHeinold.pdf
6. Introduction to Python programming for beginners by Vivian Baily Kindle edition.
7. PYTHON PROGRAMMING: Python programming: the ultimate guide from a beginner to expert by Clive Campbell.
8. Open source for python: https://hub.gke2.mybinder.org/user/jupyterlab-jupyterlab-demo-zfkdwy4y/lab

EQUIPMENT LIST

FOR STATISTICS AND DATA ANALYTICS LAB

2 laboratories. Each containing 30 computers (Desktop) with the following system requirements.

SYSTEM REQUIREMENTS			
SL NO	REQUIREMENTS	MINIMUM	RECOMMENDED
1	RAM	4GB FOR FREE RAM	8GB OF TOTAL SYSTEM RAM
2	DISK SPACE	2.5 GB AND 1 GB FORCACHES	SSD DRIVE WITH AT LEAST 5 GB OFFREE SPACE
3	MONITOR RESOLUTION	1024x768	1920×1080
4	OS(OPERATINGSYSTEM)	OFFICIALLY RELEASED 64-BITVERSIONS OF THE FOLLOWING: MICROSOFT WINDOWS 8 OR LATER	LATEST 64-BIT VERSION OFWINDOWS

FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code – BSC201

1. RATIONALE

Fundamentals of Electrical and Electronics Engineering is essential for all streams of diploma engineering to work in any industry as it covers basic electrical safety,troubleshooting and repairing of simple electrical systems. Basic knowledge of electrical wiring circuits, protective devices, electrical machines and basic electronics devices is required to work in any engineering field.

2. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences

1. Perform and test domestic wiring
2. Can operate electrical machine
3. Test different electronics devices

3. INSTRUCTIONAL STRATEGY

1. Expose to different learning tools used in respective labs, Operational safety and Procedureto be followed in the laboratory.
2. Instructor should give examples from daily routine as well as, engineering/technology applications on various concepts and principles in each topic so that students are able to understand and grasp these concepts and principles. In all contents, SI units should be followed.
3. Activity- Theory - Demonstrate/practice approach may be followed throughout the course sothat learning may be skill and employability based.

4. COURSE OUT COMES

On successful completion of the course, the students will be able to

CO1	Comply with the safety procedures
CO2	Apply the fundamentals of electricity.
CO3	Install and test electrical wiring system.
CO4	Identify and Operate electrical machines, Batteries and UPS.
CO5	Identify and test the different electronic devices.

5. COURSE TOPICS:

Unit No	Unit Name
1	Electrical Safety
2	Electrical Fundamentals
3	Protective Devices and Wiring circuits

4	Electric Machines and Batteries and UPS
5	Introduction to Electronic Devices and Digital Electronics
	Total

6. COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

Sl No	**Unit skill set (In cognitive domain)** *On successful completion ofthe class, the students willbe able to*	**Topics/Subtopics**	**Practical**	**Hours L-T-P**
		UNIT-1 Electrical Safety		
1	Comply with the Electrical safety	1. Electrical Symbols 2. Electrical safety • Identify Various types of safety signs and what they mean • Demonstrate and practice use of PPE • Demonstrate how to free a personfrom electrocution	1. Electrical symbols related to electrical engineering. 2. Electrical safety 3. Electrical earthing	

		• Administer appropriate first aid to victims, bandaging, heart attack, CPR, etc. • Fire safety, causes and precautionar y activities. • Use of appropriate fire extinguishers on different types of fires. • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Inform relevant authority about any abnormal situation • Earthing: Types ➢ http://nreeder.com/Flash/symbols.htm ➢ http://bouteloup.pierre.free.fr/iufm/as/de/house/safety.html		
		UNIT-2 **Electrical Fundamentals**		
2	1. Identify and select the different measuring devices. 2. Identify different electrical supply systems 3. Identify open circuit, close circuit and short circuit conditions.	1. Describe the sources of electrical energy. 2. Electrical current, voltage, emf, potential difference, resistance with their SI units. 3. Mention the meters used to measure different electrical quantities. Identification Measuring devices • Ammeter • Voltmeter • Wattmeter • Ohmmeter • Digital Multimeter • Megger • Tong tester 4. Explain supply systems like AC, DC. ➢ http://nreeder.com/Flash/units.htm	1. Connect voltmeter and ammeter in a simple circuit. (Practicing of identification and connection of different meters)	
3	Calculate basic electrical quantities	Relationship between V, I and R. (Ohms law) Behavior of V, I in Series and Parallel DC circuits. Describe open circuit, close cir cuit and short circuit http://nreeder.com/Flash/ohmsLaw.htm	1. Measure current, voltage and analyze effective resistance in seriescircuit 2. Demonstrate effects of shorts and opens in a circuit	

4	Connect resistances in different combination	1. Equation to find the effective Resistances connected in series 2. Equation to find effective Resistances connected in parallel 3. Resistances connected series and parallel combinations 4. Simple problems.	1. Determine the equivalent Resistance of parallel connected resistances.	
5	Calculate and measurement of different parameters of an AC quantity.	**Ac sinewave: S**inusoidal voltage, current, amplitude, time-period, cycle, frequency, phase, phase difference, and their units. http://nreeder.com/Flash/freqPeriod.htm http://nreeder.com/Flash/oscilloscope.htm	Generate and demonstrate the measurement of frequency, time period and phase difference of AC quantity using CRO and function generator.	
6	1. Calculate and measure electric power and energy 2. Identify and differentiate Single phase and Three phase supply	1. Electrical work, power and power factor • SI units • Mention the meters used to measure them ➢ http://nreeder.com/Flash/powerLaw.htm	• Measure the voltage, current, powerusing relevant measuring instruments in a Single-phase load.	
7.		1. Electrical energy • SI units • Mention the meters used to measure them 2. Single phase and Three phase supply.	1. Measure single phase energy using relevant measuring instruments in a Single-phase load. 2. Measure the voltages in Three phase supply.	
UNIT-3 Protective Devices and Wiring circuits				
8.	1. Identify and select Protective Devices for given current and voltage rating 2. Identify and select the various electrician tools	• Necessity of Protective Devices • Various Protective devices and their functions • fuse wire, • Glass cartridge fuse • HRC fuse • Kit-kat fuse • MCB • MCCB	1. Wire up and test PVC Conduit wiring to control one lamp from two different places using suitable protective devices.	

		• RCCB • ELCB • Relay • Different types of electrician tools and their function. • Describe various wiring tools. • State procedure of care and maintenance of wiring tools.		
9	1. Identify and select Wiring systems for a given applications 2. Identify and select the cables used for different current and voltage ratings. 3. Draw the wiring diagram	1. Describe different types of wiring systems. • Surface conduit • concealed conduit • PVC casing capping 2. Wiring systems and their applications. 3. Describe the types of wires, cablesused for different current and voltageratings.	1. Wire up and test PVC Conduit wiring to control of 2 sockets and2 lamps.	
10	Estimate and plan electrical wiring	Explain Plan and estimate the cost of electrical wiring for one 3m × 3m room consisting of 2 lamps, 1ceiling fan, 2 three pin sockets.	Prepare the estimation and plan	
UNIT-4 Electrical Machines and Batteries and UPS				
11	1. Identify the types of transformer. 2. verify the transformation ratio.	**Transformer** • working principle • Transformation ratio • Types and applications with their ratings	Connect the Single- phase transformer as Step-Up, Step-Down transformer and verify the transformation ratio.	
12	1. Start and run the induction motor. 2. Troubleshoot DOL/Star-delta starter and induction motor	**1. Induction motor** • Single phase and three phase Induction motor. • Necessity of starters. • Describe DOL AND STAR-DELTA starters. 2. What are different causes and remedies for a failure of starter and induction motor.	1. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Star-delta starter. 2. Troubleshoot the DOL/ Star-delta starter and induction motor	

13	Select and test the battery for a given application	**Battery** • Types of batteries (Lead acid battery, lithium, sealed maintenance free (SMF) battery, Modular battery). • Selection criteria of batteries for different applications. • Ampere-Hour Capacity. • Efficiency	Testing Condition of charging and discharging of a Lead-acid battery	
14	Select the size of the UPS for a given application	**UPS** • List the types and applications • Selection criteria of UPS • Sizing of UPS	Sizing of UPS	
UNIT-5 **Introduction to Electronic Devices and Digital Electronics**				
15	Identify and differentiate Conductors, insulators and semiconductors.	1.Compare Conductors, insulators and semiconductors with examples. 2. Identification of types and values of resistors-color codes. ➢ http://nreeder.com/Flash/resistor.htm	Determine the value of resistance by color code and compare it with multimeter readings.	
16	Identify and test PN junction Diode	**PN junction diode** • Symbol • Characteristics • Diode as switch. • Types of diodes and ratings • Applications	Identify the terminals of a Diode and test the diode for its condition.	
17	Build and test bridge rectifier circuit	**Rectifier** • Need for AC to DC conversion • Bridge rectifier with and without C filter, • Rectifier IC.	Construct and test bridge rectifiers using semi-conductor diode and rectifier IC. Compare the waveforms using CRO.	
18	1. Identify and test Transistor 2. Build and test transistor as an electronic switch	**Transistor (BJT)** • Symbol • Structure • Working principle	1. Identification of transistor terminals and test. 2. Construct and test the transistor as an electronic switch	
19.	1. Identify and test different digital IC 1.	• Comparison of analog and digital signal • Digital systems, examples. • Binary numbers, Boolean identities and laws. • Digital system building blocks: Basic logic gates, symbols and truth tables. IC-Definition and advantages.	• Test a Digital IC. • Identification and selection of suitable ICs for basic gates. 1. Verify NOT, AND, OR, NOR, EXOR and NAND gate operations (two inputs).	

20	Identify and test various Sensors and actuators.	**1. Sensors** • Concept • Types: Temperature, Pressure, Water, Light, Sound, Smoke, proximity Sensors, Flow, humidity, voltage, vibration, IR (Principle/working, ratings/ specifications, cost, and applications) **2. Actuators** • Concept • Types and applications. • Relay as an actuator.	2. Connect and test an IR proximity sensor to a Digital circuit. • Connect and test a relay circuit using an Opto-coupler. (Photo Diode & Transistor) **Refer note**	
21	Know the application of Microcontroller and PLC	• Microcontroller as a programmable device, and list of real-world applications. • PLC and Their applications. (Activity based learning)	• Identify different application microcontroller. • Identify commercially available PLC and their specifications	
			TOTAL	

7. PRATICAL SKILL EXERCISES

Sl. No.	Practical Out Comes/Practical exercises
1	□ Identify Various types of safety signs and what they meanDemonstrate and practice use of PPE □ Demonstrate how to free a person from electrocution appropriate first aid to victims, bandaging, heart attack, CPR, etc. □ Fire safety, causes and precautionary activities. □ Use of appropriate fire extinguishers on differenttypes of fires. □ Demonstrate rescue techniques applied during firehazard. □ Inform relevant authority about any abnormalsituation during fire hazard.
2	• Demonstrate different types of earthing/usingvideos. • Prepare a Report on types of Earthing
3	Connect voltmeter and ammeter in a simple circuit. (Practicing of identification andconnection of different meters)
4	1.Determine the equivalent Resistance of series connected resistances.

	2.Demonstrate effects of shorts and opens in acircuit
5	Determine the equivalent Resistance of parallelconnected resistances.
6	Generate and demonstrate the measurement of frequency, time period and phase difference of ACquantity using CRO and function generator.
7	Measure the voltage, current, power using relevant measuring instruments in a Single- phase load.
8.	1.Measure single phase energy using relevantmeasuring instruments in a Single-phase load. 2. Measure the voltages in Three phase supply.
9.	Wire up and test PVC Conduit wiring to control onelamp from two different places using suitable protective devices.
10	2. Wire up and test PVC Conduit wiring to control of 2sockets and 2 lamps.
11	Wire up and test PVC Conduit wiring to control onelamp from two different places.
12	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 CFL 1ceiling fan, 2 threepin sockets.
13	Connect the Single- phase transformer as Step-Up,Step-Down transformer and verify the transformation ratio.
14	Construct a suitable circuit to start and reverse the direction of three phase induction motor usingDOL/star-delta starter.
15	Troubleshoot the DOL/Star-delta starter andinduction motor
16	Testing Condition of charging and discharging of aLead-acid battery.
17	Estimate the UPS rating for a computer lab with 50computers/domestic.
18	Determine the value of resistance by color code andcompare it with multimeter readings
19	Identify the terminals of a Diode and test the diode for its condition.
20	Construct and test bridge rectifiers using semiconductor diode and rectifier IC. Compare thewaveforms using CRO.
21	Identification of transistor terminals and test. Construct and test the transistor as an electronicswitch.
22	Test an IC. Verify the truth-table AND, OR, NOT logic gates.
23	Verify the truth-table NAND, NOR, EX-OR, EX-NORlogic gates.

24	Connect and test anIR proximity sensor to a Digital circuit. **NOTE:**Any sensor listed in the theory may beused for condition appropriately.
25	Connect and test a relay circuit using an Optocoupler.(Photo Diode & Transistor)
26	1.Identify MCS-51 variants 2.Identify commercially available PLC and theirspecifications.

SUGGESTED LEARNING RESOURCES:

Reference Books:

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014 Edition.
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineering byV. Mittle and ArvindMittle, McGrawHill Companies, 2005 Edition.
5. The 8051 Microcontroller & Embedded systemsusinkbnnnjbbh bb vvvvg assembly and C (2ndEdition)–M.A.Mazidi , J.C. Mazidi&R.D.McKinlay ISBN: 81-317-1026-2
6. Programmable Logic controllers, W BOLTON

e-Resources

1. https://www.youtube.com/watch?v=mc979OhitAg&list=PLWv9VM947MKi_7yJ0_FCfzTBXpQU-Qd3K
2.https://www.youtube.com/watch?v=CWulQ1ZSE3c3.
en.wikipedia.org/wiki/Transformer
2. www.animations.physics.unsw.edu.au//jw/AC.html
3. www.alpharubicon.com/altenergy/understandingAC.htm
4. www.electronics-tutorials
5. learn.sparkfun.com/tutorials/transistors
6. www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
7. www.technologystudent.com/elec1/transis1.htm
8. www.learningaboutelectronics.com
9. www.electrical4u.com
10.https://www.youtube.com/watch?v=zLW_7TPf310 11.
https://www.youtube.com/watch?v=8PTNjw-hQIM

ELEMENT OF MINIMG

Subject Code – MIN201

Course Objectives:

The subject is pre-requisite for understanding mineral exploitation methods in underground mining and to know the importance of development requirements for approaching underground Metalliferous ore deposits

Teaching Approach:

• *Teachers should give examples from daily routine as well as, engineering/technology applications on various concepts and principles in each topic so that students are able to understand and grasp these concepts and principles. In all contents, SI units should be followed.*

• *Use of demonstration can make the subject interesting and develop scientific temper in the students. Student activities should be planned on all the topics.*

• *Activity- Theory - Demonstrate/practice approach may be followed throughout the course so that learning may be outcome and employability based.*

COURSE CONTENT

Unit	Allotted Hrs.
General concepts of Mine Development	10
The initial developmental openings	10
The Ordinary methods of Shaft sinking	10
Further development	10
Supporting materials	06
Forms of supports	06

Course Outcomes:

After undergoing this subject, the student will be able to:

CO1- Understand the Concepts of Mine development
CO2- Understand the initial developmental openings
CO3- Understand the approaches required to develop underground mine.
CO4- Understand the underground supports.

References:

1. Introduction to mining, by Higgam
2. Elements of Mining Technology, Vol. I, By D.J.Deshmukh
3. UMS Volumes.

DETAILED COURSE CONTENT.

Unit No & Name	Course Content
General concepts of Mine Development	Importance of mining engineering, Comparison of undergroundand Opencast mining.
	Surface prospecting: Choice of locality. Methods of Prospection: Inspection of outcrops ,Presence of "float'', Trenching by panning, Trenching, The examination of alluvial flats,
	Physical Prospecting methods. Underground prospecting
	Factors governs the choice of boring methods, The chief uses of boreholes
	Comparison of percussive and rotary drilling
	The Diamond Boring System: General surface arrangements.
	The Diamond Boring System: General surface arrangements.
	Core recovery: Single tube and double tube core barrel.
	Collection of data from boreholes.
	Various mining terms explained.
The initial developmental openings.	Various mining terms explained.
	TEST - 1
	Shaft: Vertical, Incline and compound.
	Factors which influence the choice of the type of shaft.
	The shapes of shafts: Rectangular, Square,
	The shapes of shafts: Circular and elliptical.
	The size of shafts, and the number of compartments.
	Factors governing site of shafts: At the surface and Underground.
	Surface plant and Equipment
	TEST - 2
The Ordinary methods of Shaft sinking	General arrangement of Shaft sinking
	Temporary lining
	Permanent lining of shaft sides.
	Walling scoffold, the sinking kibble and Rider.
	Drilling for a sinking shaft
	Shot firing: Arrangement of holes, charging and firing,precautions for safety.
	Removal of debris: Mechanical loading,
	TEST - 3
	Dealing with water, Water ring or Garland.
	Shaft centering arrangement.
	Shaft station
Further Development	Ore-bins: Transverse section of shaft station and ore bin wherethe inclined shaft is in the footwall
	Transverse section of shaft station and ore bin in a vertical shaft.
	Brow bin and waste bin
	The length of back
	TEST - 4
	Drives: Reef drive and Footwall drive.

	Raises and Winzes.
	Footwall cross cuts and Ore-passes.
	Familiarizing the names of different stopes: Open stopes, Filled stopes, Shrinkage stopes, Caving methods.
Supporting materials	Materials employed for support
	Kinds of timber for use as supports in mining.
	Preservation of timber
	TEST - 5
	Comparison of steel supports and timber supports. The use of waste rock for support
	Forms of Timbering: A prop, a pigsty or crib.
Forms of supports	Stull, a duplex pack-mat, A chock mat.
	A complete timber set and An incomplete timber set.
	A concrete column, A masonry setting.
	Support of junction by cogs and bars.
	Steel arches and roof bolting.
	TEST - 6

IT SKILLS

Subject Code – CSE101

1. RATIONALE

Information Technology is crucial to the majority of the business and has a great influence oninnovation and engineering. Every branch of engineering and every organization opt for computers and IT skills for business automation, communication/connectivity, resource planning, work automation and securing information etc. All engineering diploma students must be conversant with the basic IT skills which empower them to learn new technologies, adapt to changes, businessdevelopment, communication etc.

2. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching –learning experiences.

Perform jobs related to web design and maintenance, business process automation tool management, cyber security and safety and program assistant.

3. COURSE OBJECTIVES

1. Demonstrate the basics of coding.
2. Design and develop web pages that include static and dynamic content.
3. Describe the basic concepts of Cloud and IoT.
4. Express the workflow and business automation
5. Recognize the best practices of Cyber Safety and security.

DETAILS OF COURSE CONTENT

The following topics/sub topics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

UNIT NO	Topics/Sub topics	Unit skill set/Learning outcomes (In cognitive domain)	Hours L-T-P
1	**UNIT 1 - INTRODUCTION TO BASICS OF CODING**		
	1.1 Introduction to computer programming 1.2 Algorithms –With sufficient examples 1.3 Flowcharts – With sufficient examples 1.4 Execute simple programs **Note: Below listed or any other suitable online/offline coding platforms should be used to demonstrate and provide coding experience to students.** **a. https://scratch.mit.edu/**	1. Understand computer programming 2. Create and write Algorithm for programmable problems. 3. Design Flowchart for programmable problems. 4. Develop simple Android application.	

	b. https://studio.code.org/projects Suggested programs are listed in Table 1 1.5 Introduction to Application development **1.6** Simple android application development (No knowledge of programming language is required). **Note:** ***i. The purpose of application development is to ignite and promote programming skills.*** ***ii. Application development should be done using any App builder platforms such as*** ***iii. MITApp Inventor: https://appinventor.mit.edu/*** ***iv. Thunkable: https://thunkable.com/*** ***v. ibuildapp: https://ibuildapp.com/*** ***vi. The student should be introduced to the android application development environment for further research and learninghttps://developer.android.com/*** 1.7 Activity: create a simple Android application (Unique for each student) publish on the learning management system.		
2	**UNIT 2 - DESIGN AND DEVELOP WEB PAGES**		
2	2.1 Basic web technologies ▪ Browser ▪ Web –Server ▪ Client-Server Model ▪ URL ▪ SEO techniques ▪ Domain names and domain name system. 2.2 Creating Web-pages with HTML5 - Static	1. Understand and examine basic web technologies 2. Creating static web pages 3. Formatting Webpages with cascading style sheets (CSS) 4. Creating Dynamic web pageswith JavaScript	

	web pages. ▪ Introduction, Editors ▪ Tags, Attributes, Elements, Headings ▪ Links, Images, List, Tables, Forms ▪ Formatting, Layout, Iframes. 2.3 Formatting web pages with style sheets (CSS3). ▪ Introduction to CSS ▪ Inline CSS, Internal CSS, Classes and IDs ▪ div, Color, Floating, Positioning ▪ Margins, Padding, Borders ▪ Fonts, Aligning Text, Styling Links 2.4 Creating a web page dynamic using JavaScript. ▪ Dynamic web page and Introductionto JS ▪ Basic syntax ▪ Functions ▪ Events Note: Refer https://www.w3schools.com **2.6** Creating dashboards in websites. **2.6 Activity: Personal website design and launch with a free platform or Create a Blogging website.** ▪ **Online platforms (Learning andexecuting)** ▪ **https://www.w3schools.com/** ▪ **https://studio.code.org** ▪ **https://www.khanacademy.org** **Note:** **1) The student must be introduced to website development platforms - worldpress.com.** **2) The student must be made familiar**	5. Creating and launching dashboard based personalwebsite.	

	with launching websites . Certification available: • HTML - W3schools • CSS - W3schools • JavaScript - W3schools		
3	**UNIT 3 -BUSINESS PROCESS AUTOMATION/ERP**		
3	3.1 Introduction to business process automation. 3.2 Organization structure and functions composition-Properties and applications ▪ Structure ▪ Types ▪ Functional Units **Note: Students should be made familiar with organization, types and components of a big enterprise to make him understand the working of organization keeping him as part of org.** 3.3 Workflows ▪ Introduction ▪ Components ▪ Use and use cases **Note: Use free and open-source platform to demonstrate and create workflows.** **Example:** **https://airflow.apache.org/** **https://taverna.incubator.apache.org/** **https://trello.com/** **https://www.processmaker.com/** 3.4 Enterprise resource planning ▪ History ▪ Evolution ▪ Uses of ERP ▪ ERP software tools.	1. Identify and examine the needsof business process automation. 2. Understand Organization structure and functions 3. Create and use workflows 4. Use Enterprise resource planning in workplace.	

	Note: The student should be introduced into Enterprise resource planning software tools to understand importance of ERP. **Examples:** ▪ **https://erpnext.com/** ▪ **www.bitrix24.com** ▪ **https://www.odoo.com/** **3.5 Activity:** ▪ **Project plan for summer internship - use open source ERP Software** ▪ **Identify different components of nearby organization with recourse plan and workflow design.** ▪ **Identify types of ERP software available with their market share.**		
4	**UNIT 4 - INTRODUCTION TO CLOUD AND IOT CONCEPTS**		
	4.1 Fundamentals of cloud 4.2 Cloud service models ▪ IaaS (Infrastructure-as-a-Service) ▪ PaaS (Platform-as-a-Service) ▪ SaaS (Software-as-a-Service) 4.3 Cloud deployment types ▪ Public, ▪ Private, ▪ Hybrid ▪ Community Cloud 4.4 Cloud services: ▪ Google Drive - file storage and synchronization service developed by Google; ▪ Google docs- bring your documents to life with smart editing and styling tools to help you easily format text and paragraphs; ▪ Google Co-lab (Usage of Jupyter Notebook): *Colab* notebooks allow you to combine	1. Understand Cloud concepts 2. Identify and use Cloud services 3. UnderstandIoT concepts 4. Identify IoT applications	

	executable code and rich text in a single document, along with images, HTML, LaTeX, and more. ▪ Google App Engine: Google App Engine is a Platform as a Service and cloud computing platform for developing and hosting web applications in Google-managed data centers. Applications are sandboxed and run across multiple servers. **Note: Above cloud services are not compulsory for all branches; teacher can recommend other cloud service based on need of engineering branch.** 4.5 Working of IoT and IoT components (Only brief introduction and demonstration through videos) 4.6 Explain concept of Internet of Things with examples ▪ Smart home ▪ Smart city ▪ Smart farming **Note:** **a. Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected over TCP/IP to establish IoT.** **b. The students should be introduced to the IoT environment for further research and study**. **Example:** ▪ **https://www.raspberrypi.org/** ▪ **https://www.arduino.cc/**		

	4.7 Activity: **Create your cloud service account and demonstrate using cloud services.** **Identify cloud service provider with respectto service models and deployment types.** **Identify areas where Internet of Things could bring positive changes.**		
5	**UNIT 5 - CYBERSECURITY AND SAFETY**		
	5.1 Introduction to Cyber security and cyber safety. ▪ Brief awareness on cyber safety measures ▪ Identification of basic security issues in mobile phones and personal computers ▪ Installation of Antivirus software ▪ Firewall concepts ▪ Browser settings ▪ Importance of privacy and Password policy (Best practices). 5.2 Common threats - Demonstration ▪ Phishing ▪ DoS attack ▪ Man in the middle attack ▪ Eavesdropping ▪ Spamming **5.3 Activity** ▪ **Identification of basic security issues in computers of your college and fixing the same.** ▪ **Visit nearby government organization.** ▪ **Identify basic cybersecurity issuesand fixing the same** ▪ **Demonstrate the importance of cybersecurity, password policy, and cyber safety.**	1. Identify need for Cyber security and cyber safety 2. Identify basic security issues in mobile phones and personal computers 3. Examine Importance of privacy, Password policy 4. Implement best practices of cyber safety and security in work place	

9. SUGGESTED PRACTICAL SKILL EXERCISES

TABLE-I

Sl. No.	Practical Out Comes/Practical exercises
1	Write an algorithm for programmable problemsExample for Reference: • Add/subtract two numbers • Find the largest/smallest of 3 numbers • Calculate and print sum of 'N' numbers
2	Design a flowchart for programmable problemsExample for Reference: Add/subtract two numbers Find the largest/smallest of 3 numbersCalculate and print sum of 'N' numbers
3	Design and create simple game using MIT-scratch/Code.org
4	Design and create simple android application (MIT App Inventor)
5	Design and create webpage for displaying your poem (Title, header, paragraph, formatting tags)
6	Design and create webpage for your wish list (What you want todo). Also list challenges and opportunities along with images to present your dreams (List ordered and unordered, Image, table)
7	Design and create webpage using HTML and CSS about an awesome animal (Use necessary CSS tags)
8	Design and create web page for a travel book/recipe book with more than 3 pages, table to list places/recipes (iframe, hyperlink)
9	Design and create web page with JavaScript to design a simple calculator to perform the following operations: sum, product,difference and quotient
10	Design and create a personal webpage with dashboard
11	Design and create web page about advantages of business process automation with respect to your branch of engineering

12	Create a workflow for education loan approval in bank/diploma admission process (Use any tool)
13	Demonstrate ERP with ERPNext Demo for manufacturing, retail and service sector (Use any other ERP tools)
14	Create user account and demonstrate use of Google drive, Googledocs, Google Co-lab (Usage of Jupyter Notebook)
15	1.1 Demonstrate Internet of Things using with examples a. Smart home b. Smart city c. Smart farming Note: Teacher can also select specific area of work where Things (autonomous computing devices) could be interconnected overTCP/IP to establish IoT.
16	Installation of Antivirus software
17	Demonstration and hands on browser settings
18	Demonstration and hands on privacy settings and password policy
19	Demonstration of common security threats (using videos) a. Phishing b. DoS attack c. Man in the middle attack d. Spamming e. Virus

The suggested practical activities (TABLE-I) in this section are demonstrated for the attainment of the competency. These practical activities can also be used for the student assessment in portfolio mode for awarding CIE marks. **The lecturer can enhance the competency level of the students by sketching more practical exercises.**

SUGGESTED LEARNING RESOURCES

BOOKS	
1	The Art of Programming Through Flowcharts & Algorithms, A. B. Chaudhuri, Firewall Media publication
2	HTML5 Black Book, by Publishing company Limited. Kogent Learning Solutions Inc.
3	"World Wide Web design with HTML", Xavier, Tata McGraw-Hill

4	Internet of Things – A Hands on Approach, By ArshdeepBahga and Vijay Madisetti Universities Press, ISBN: 9788173719547
URL'S	
1	https://scratch.mit.edu
2	https://studio.code.org
3	http://ai2.appinventor.mit.edu
4	https://www.w3schools.com
5	https://www.tutorialspoint.com/javascript/index.htm
6	https://www.geeksforgeeks.org/html-tutorials/
7	Android https://developer.android.com
8	https://www.khanacademy.org
9	Tools for Web Development a. https://www.wix.com
	b. https://atom.io/ c. https://www.openelement.com/ d. https://www.layoutit.com

ENVIRONMENTAL SUSTAINABILITY

Subject Code – AUC201

COURSE OBJECTIVES:

Technicians working in industries or elsewhere essentially require the knowledge of environmental science so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

1. Solve various engineering problems applying ecosystem to produce eco – friendly products.
2. Use relevant air and noise control methods to solve domestic and industrial problems.
3. Use relevant water and soil control methods to solve domestic and industrial problems.
4. To recognize relevant energy sources required for domestic and industrial applications.
5. Solve local solid and e-waste problems.

COURSE OUTCOMES:

At the end of the course student will be able to know :

CO1	Importance of ecosystem and terminology.
CO2	The extent of air pollution, effects, control measures and acts.
CO3	The extent of noise pollution, effects, control measures and acts.
CO4	The water and soil pollution, effects, control measures and acts
CO5	Different renewable energy resources and efficient process of harvesting.
CO6	Solid Waste Management and Environmental acts.

COURSE CONTENT:

Marks:	***Unit-1 Ecosystem***	*Allotted Hrs:*
Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem. Global warming - Causes, effects, Green House Effect, Ozone depletion.		
Marks:	***Unit-2Air Pollution***	*Allotted Hrs:*
Air pollution, Natural and manmade sources of air pollution, Effects of air pollution.Air Pollutants and Types. Control of air pollutants by Cyclone separator and Electrostatic Precipitator, Air (prevention and control of pollution) act 1981		
Marks:	***Unit-3 Noise Pollution:***	*Allotted Hrs:*
Noise pollution: sources of pollution, measurement of pollution level, Effects and Control of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000		
Marks:	***Unit- 4Water and Soil Pollution:***	*Allotted Hrs:*
Water pollution and Sources of water pollution, Types of water pollutants, Characteristics of water pollutants,control measures of water pollution. Definition and list unit operations in water and WasteWater Treatment process,Water (prevention andcontrol of pollution) act 1974, Water conservation – Importance of Rain Water Harvesting. Soil pollution, Causes, Effects and Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides		
Marks:	***Unit-5 Renewable sources of Energy***	*Allotted Hrs:*

Solar Energy: Basics of Solar energy. Definition and advantages of advanced solar collectors. Solar waterheater and Solar stills and their uses. *Biomass:* Overview of biomass as energy source. Thermal characteristics of biomass as fuel. *Wind energy:* Current status and future prospects of wind energy. Wind energy in India. Need of new Energy sources, Different type's new energy sources. Environmental benefits of New Energy Sources-Hydrogen energy, Ocean energy resources, Tidal energy conversion.		
Marks:	***Unit-6 Solid Waste Management and Environmental Acts***	*Allotted Hrs:*
Solid waste generation, Sources and characteristics of Municipal solid waste, Solid Waste Managementrules 2016- 3R in SWM. E- Waste generation, Sources and characteristics, E waste management rules 2016 Plastic Waste generation, Sources and characteristics, Recycled plastic rules 2016 Importance of Environment (protection) act 1986 Occupational health and safety measures.		

Unit No & Name	**Detailed Course Content**
1. Ecosystem	Structure of ecosystem, Biotic & Abiotic components, Aquatic (Lentic and Lotic) and terrestrial ecosystem.
	Global warming - Causes, effects.
	Green House Effect, Ozone depletion - Causes, effects
2. Air and Pollution	Air pollution, Natural sources of air pollution, Man Madesources of air pollution
	Air pollutants and Types, Effects of Particulate Pollutants andcontrol by Cyclone separator
	Effects of Particulate Pollutants and control by Electrostatic Precipitator, Air (prevention and control of pollution) act1981.
3. Noise Pollution	Noise pollution: sources of pollution, Measurement of Noisepollution level.
	Effects and Control of Noise pollution. Noise pollution (Regulation and Control) Rules, 2000
4. Water and Soil Pollution:	Sources of water pollution. Types of water pollutants,Characteristics of water pollutants.
	Control measures of water pollution.
	Definition and list unit operations in water and WasteWater Treatment process, Water (prevention and control ofpollution) act 1974.
	Water conservation – Importance of Rain Water Harvesting
	Soil pollution, Causes and Effects due to Fertilizers, Pesticidesand Insecticides
	Preventive measures of Soil Pollution due to Excessive use of Fertilizers, Pesticides and Insecticides.
5.	Solar Energy: Basics of Solar energy. Solar collectors and advantages of Advanced solar collectors.
	Solar water heater, Solar stills and their uses.
	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel.
	Wind energy: Current status and future prospects of windenergy. Wind energy in India.

Renewable sources of Energy	Need of new Energy sources, Different type's new energysources. Environmental benefits of New Energy Sources-Hydrogenenergy
	Environmental benefits of New Energy Sources- Ocean energyresources
	Environmental benefits of New Energy Sources-Tidal energyconversion.
6. Solid Waste Management And Environmental Acts	Solid waste generation, Sources, Characteristics of solid waste Solid Waste Management rules 2016
	E- Waste generation Sources and characteristics,E waste management rules 2016
	Plastic Waste generation Sources and characteristics, Plastic Waste Sources and characteristics
	Recycled plastic rules 2016,Importance of Environment(protection) act 1986,
	Occupational health and safety measures.

References:

(a) Suggested Learning Resources:

Books:

1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099.
4. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000,ISBN 10: 0471144940.
5. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, NewDelhi
6. Rao, C. S., Environmental Pollution Control and Engineering, New Age InternationalPublication, 2007, ISBN: 81-224-1835-X.
7. Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford,UK; 2013. ISBN: 9780123978257.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07- 451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978,ISBN: 9780070354760.
10. Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993-502- 6
11. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.
12. Keshav Kant, Air Pollution & Control, Khanna Publishing House, New Delhi (Edition 2018)

(b) Open source software and website address:

1) www.eco-prayer.org
2) www.teriin.org
3) www.cpcp.nic.in
4) www.cpcp.gov.in
5) www.indiaenvironmentportal.org.in
6) www.whatis.techtarget.com
7) www.sustainabledevelopment.un.org
8) www.conserve-energy-future.com

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/subtopics.
- 15-20% of the topics which are relatively simpler or descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit sites such as Railway station and research establishment around theinstitution.