Chhattisgarh Swami Vivekanand Technical University, Bhilai

Diploma in Civil/Electrical/EEE/Mining & Mine Surveying/GIS & GPS/Cement Technology (Group-IA) **Semester-II**

A) Course Code : 2000271(046)

B) Course Title : Communication Skills-II

C) Pre- requisite Course Code and Title :

D) Rationale :

In the present competitive world communication skills are vital for growth in any field. Communication Skills in English is one of the core skills to be developed in diploma graduates as students exchange information and convey their ideas and opinions with different stakeholders The present curriculum continues to focus on the attainment of course outcomes related to speaking, reading, writing and listening as verbal, non-verbal and written communication are essential in order to deliver and receive information quickly and accurately.

This curriculum is advancement over the previous to meet the existing industrial and entrepreneurial challenges by focusing on the attainment of professional communication skills and enable the students for effective communication in diverse situations.

E) Course Outcomes:

CO-1 Use grammatically correct sentences in Speaking and Writing.

CO-2 Demonstrate appropriate non-verbal expression while communicating with others.

CO-3 Compose paragraphs and draft letters using correct formats.

CO-4 Draft different types of report, notices and mails in prescribed format.

F) Scheme of Studies:

S.No.	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credit(C) L+ T+(P/2)
1.	Humanities	2000271 (046)	Communication Skills-II	2	-	1	3

L-Lecture, P-Practical, T-Tutorial

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and other), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) T- Tutorial includes Sessional Work (SW) (includes assignment, seminar, mini project etc.) and Self Learning (SL), C: Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

G) Scheme of Assessment:

S. No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1.	Humanities	2000271 (046)	Communication Skills-II	70	20	30	-	-	120

Legend: ESE: End Semester Exam, CT: Class Test, TA: Teacher Assessment

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T- Tutorial includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO-1 Use grammatically correct sentences in Speaking and Writing.

(Hours-12)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Use modifiers in proper place SO1.2 Use auxiliaries SO1.3 Change Narration SO1.4 Use different degree in sentences SO1.5 Correct Use of Adverbial Phrases.		**Unit-1.0 English Grammar** 1.1 Auxiliary Verbs 1.2 Modifiers & Adverbial Phrases 1.3 Degree 1.4 Narration	• One Word Substitution • Rearrangement of Jumbled words

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Exercises on the topic: Modifiers, Narration, Degree etc.

b. Mini Project:

i. Express your views by writing an incidence using proper grammar.

ii. Select topic and share your views on the same with the audience. (2-3 min.)

c. Other Activities (Specify):

i. Practice for speaking skills in front of mirror for self feedback.

CO-2 Demonstrate appropriate non-verbal expression while communicating with others in different situations.

(Hours- 8)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Explain the features and use of static and dynamic features of non verbal communication. SO2.2 Interpret the gesture, posture and facial expression in the given photograph and visual.	LE2.1 Use appropriate gestures, eye movements, facial expressions, postures for communication. LE2.2 Demonstrate appropriate etiquettes while working in team and group. .	**Unit-2.0 Non-Verbal Communication** 2.1 Static features of Non Verbal Communication – Distance, Posture, Physical contact etc. 2.2 Dynamic features of Non-Verbal Communication – Mannerism, Head & Hand movement, Eye to Eye contact, Facial expressions, Gestures.	• Collect data about good postures, expressions, visuals related to non verbal communication for Effective Communication. • Imitate your ideal personality.

SW-2 Suggested Sessional Work (SW):

c. Assignments:

i. Collection of pictures and visuals with static and dynamic features of non verbal communication.
ii. Interpretation of gesture, posture and facial expression in the given photograph and visual.

d. Mini Project:

i. Seminar on topics related to "Role of non verbal communication for developing effective communication in technical education".

e. Other Activities (Specify):

i. Role play on given theme such as: When a student gets exceptionally good marks or less marks in 10^{th} board exams, bank manager refuses to sanction the education loan at the last moment, unrest among the first year students during fresher party. Student and teacher can add the themes as per requirement.

CO-3 Compose paragraphs & draft letters, using correct format.

(Hours-14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Draft business letters. SO3.2 Draft Job application and Resume SO3.3 Develop paragraphs on different topics		**Unit- 3.0 Paragraph & Letter Writing** 3.1 Paragraph writing. 3.2 Letter writing 3.2.1 Purposes of Letters 3.2.2 Characteristics of a Letter 3.2.3 Types of Business Letters -Applications for Job & Resume Writing -Letter of Enquiry -Letter for Order Placement -Letter of Complaints	• Read the sample letter, circular, notice, case and paragraph on selected theme on Internet.

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

i. Write an application to apply for campus recruitment drive to be held in your college.
ii. Draft business letters.

b. Mini Project:

i. Prepare Resume and cover letter for job vacancy.
ii. Write a letter to appropriate authority informing about the activities to be conducted in Department/Institute.

c. Other Activities (Specify):

i. Analyze the given case and suggest views/opinion with respect to case brief.

CO-4 Draft different types of reports notices and mails in correct format.

(Hours –14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Explain the characteristics of a good report. SO4.2 Explain general outline of a project report SO4.3 Prepare Progress reports in correct format. SO4.4 Draft Notices & mails	LE4.1 Write and submit a notice on the given theme. LE4.2 Draft an Email to the Principal of your institute informing that you couldn't attend regular classes etc.	**Unit 4.0 Technical Report Writing** 4.1 Report Writing 4.1.1Characteristics of a Good Report. 4.1.2 Types of Technical Report. 4.2 General outline of Project Report 4.3 Progress Report of any assumed work 4.4 Notice 4.4.1 Purposes of Notices 4.4.2 Qualities of Notices 4.4.3 Format of Notice 4.5 Mail 4.5.1 Purposes of Mail 4.5.2 Format of Mail	• Read and practice different Types of Reports.

SW-4 Suggested Sessional Work (SW) :

a. Assignments:

i. Prepare notice for your class/department as per given directions.
ii. Describe qualities of a good report.
iii.Draft a progress report of any assumed work.

b. Mini Project:

i. Draft a report on any significant activity that had taken place in your locality.
ii. Draft a report on culture event/ sports event conducted at your institute.

c. Other Activities (Specify):

i. Draft notices for sports activities/ lost belongings/ various competitions/celebrations.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESE of Classroom Instruction):

Unit Number	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
I	English Grammar	2	8	10	20
II	Non verbal communication	2	3	5	10
III	Paragraph & Letter Writing	3	7	10	20
IV	Technical Report writing	3	5	12	20
Total		**10**	**23**	**37**	**70**

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, Whatsapp, Mobile, Online sources)
8. Brainstorming

K) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	English Grammar in Use	Murphy Raymond	Cambridge Publications	4th Edition
2	Living English Structure	Allen	Cambridge Publications	Fifth edition(2009)
3	Effective English with CD	Kumar, E. Suresh; Sreehari,P.; Savithri, J.	Pearson Education, Noida, New Delhi	2009 *ISBN:* 978-81-317-3100-0
4	English Grammar at Glance	Gnanamurali, M.	S. Chand and Co. New Delhi,	2011 *ISBN*:9788121929042
5	A Course in Technical English	TTTI Bhopal		
6	Elementary English Grammar and Composition	Agarwal N.K.	Goyal Brothers Prakashan	Latest Edition
7	A Study Guide on Communication Skills for Technical Students	Dr. Sumi Guha Dr. Shameena Bano	Vaibhav Prakashan	1st Edition, 2020 ISBN-978-93-89989-25-0

(b) Open source software and website address:

1. https://www.englishgrammar.org/
2. http://www.englishgrammarsecrets.com/
3. https://www.usingenglish.com/handouts/
4. http://learnenglish.britishcouncil.org/en/english-grammar
5. https://www.englishclub.com/grammar/
6. http://www.perfect-english-grammar.com/
7. http://www.englishteachermelanie.com/category/grammar/
8. https://www.grammarly.com/blog/category/handbook
9. https://www.britishcouncil.in/english/learn-online
10. http://learnenglish.britishcouncil.org/en/content
11. http://www.talkenglish.com/
12. languagelabsystem.com
13. www.wordsworthelt.com

(c) Others:

1. Learning Packages.
2. Lab Manuals.
3. Language software Manual
4. Users' Guide

L) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Computers	A complete computer system with headphones & Speakers	All
2	Software	English Communication Softwares – Globarina, A-One Solutions, Wordsworth, Spears	All
3.	Computer tables & chairs	Depending upon the size of the Language Lab	All

M) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	**Programme Outcomes (POs)**										**Programme Specific** Outcomes **(PSOs)**	
	PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Experiments and practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2
CO-1 Use grammatically correct sentences in Speaking & Writing.	2	1	1		-	-	-	1	2	3	2	1
CO-2 Demonstrate appropriate non-verbal expression while communicating with others.	1	1	2	2	-	-	-	2	2	3	1	2
CO-3 Compose paragraphs &draft letters, using correct format.	1	1	1		-	-	1	1	3	2	2	2
CO-4 Draft different types of reports notices and emails in correct format.	2	1	2	2	-	1	-	2	3	3	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

N) Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(P)	Classroom Instruction (L)	Self Learning (SL)
PO1,2,3,8,9,10 PSO 1,2	CO-1 Use grammatically correct sentences during Speaking & Writing.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5		Unit-1.0 English Grammar 1.1, 1.2, 1.3, 1.4	As mentioned in relevant pages
PO 1,2,3,4,8,9,10 PSO 1,2	CO-2 Demonstrate appropriate non-verbal expression while communicating with others**.**	SO2.1 SO2.2	LE2.1 LE2.2	Unit-2.0 Effective Communication 2.1, 2.2	
PO 1,2,3,7,8,9,10 PSO 1,2	CO-3 Compose paragraphs & draft letters, using correct format.	SO3.1 SO3.2 SO3.3		Unit-3.0 Short Stories 3.1 , 3.2	
PO 1,2,3,4,6,8,9,10 PSO 1,2	CO-4 Draft different types of reports, notices and emails in prescribed format.	SO4.1 SO4.2 SO4.3 SO4.4	LE4.1 LE4.2	Unit- 4.0 Passages for Comprehension 4.1, 4.2, 4.3, 4.3, 4.4,4.5	

A) Course Code : 2000272(014)

B) Course Title : Applied Maths-II

C) Pre- requisite Course Code and Title :

D) Rationale :

This subject is introduced to those topics of mathematics, which are applied in different branches of engineering so that it can enhance required skills in mathematics underpinning engineering subjects. Integral calculus helps to find the area; differential equation is used in finding the curves and its related applications for various engineering models. Numerical integration is used to find the area of the functions especially whose integration cannot be evaluated easily with routine methods. This course further develops the skills to enable large engineering systems to be modeled.

E) Course Outcomes:

CO-1 Solve the given problems of integration using suitable methods.

CO-2 Use the concept of integration to find area of given curves.

CO-3 Model the given engineering problems using the concept of differential equation.

CO-4 Utilize the concepts of numerical methods to solve given equations.

CO-5 Measure the area using the concept of numerical integration for engineering related problems.

F) Scheme of Studies:

S.No.	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1.	Applied Science	2000272(014)	Applied Maths-II	2	-	1	3

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and other),P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies) T- Tutorial includes Sessional Work(SW) (includes assignment, seminar, mini project etc.) and Self Learning (SL), C: Credits

Note: SW and SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

G) Scheme of Assessment:

S. No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Applied Science	2000272 (014)	Applied Maths-II	70	20	30	-	-	120

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T- Tutorial includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO-1 Solve the given problems of integration using suitable methods.

(Approx. Hrs: 07)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Solve the given simple problem(s) based on rules of integration. SO1.2 Obtain the solution of given simple integral(s) using substitution method. SO1.3 Integrate given simple functions (integration by parts). SO1.4 Evaluate the given simple integral by using partial fractions.	--	**Unit-1.0 Integral Calculus** 1.1 Simple Integration: Rules of integration and integration of standard functions. 1.2 Methods of Integration: 1.21 Integration by substitution. 1.22 Integration by parts 1.23 Integration by partial fractions.	• Rules of integration • Methods of integration.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i Expound examples of integration in day-to-day life.
ii Enumerate the value of integrals for engineering related problems.

b. Mini Project:

i Prepare charts displaying standard integration formulas.
ii Identify problems based on application of integration.

c. Other Activities (Specify):

i Identify engineering problems based on real world problems with the use of free tutorials available on the Internet.
ii Use graphical software EXCEL, D-PLOT and GRAPH for related topics.
iii Use MATHCAD as mathematical tool to solve the problems of integral calculus.
iv Prepare a seminar on basic applications of integrals.

CO-2 Use the concept of integration to find area of given curves.

(Approx. Hrs: 11)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Solve given simple problems based on properties of definite integration. SO2.2 Apply the concept of definite integration to find the area under the given curve (s). SO2.3 Utilize the concept of definite integration to find area between given two curves.		**Unit-2.0 Applications of Integral Calculus** 2.1 Definite Integration 2.11 Simple examples 2.12 Properties of definite integral (without proof) and simple examples. 2.2 Applications of integration 2.21 Area under the curve. 2.22 Area between two curves.	• Standard formulas of simple integration • Properties of definite integrals. • Formulas for area between two curves

SW-2 Suggested Sessional Work (SW):

Assignments:

ii. Enumerate the area of irregular shapes by using concept of integration.
iii. Explore the use of definite integrals related to engineering applications.

b. Mini Project:

i. Prepare charts showing area of irregular shapes using concept of integration.

c. Other Activities (Specify):

i. Identify engineering problems based on real world problems with the use of free tutorials available on the Internet.
ii. Use graphical software EXCEL, D-PLOT and GRAPH for topics related to Integral calculus.
iii. Use MATHCAD as mathematical tool to solve the problems of integral calculus.
iv. Seminar on engineering applications of definite integrals.

CO-3 Model the given engineering problems using the concept of differential equation.

(Approx. Hrs: 11)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Find the order and degree of given differential equation(s). SO3.2 Form differential equation for given simple engineering problem. SO3.3 Solve given differential equation using the variable separable method. SO3.4 Obtained the solution of given Homogeneous Differential Equation. SO3.5 Solve the given linear differential equations.	--	**Unit-3.0 Differential equations of first order and first degree** 3.1 Concept of differential equation 3.2 Order, degree and formation of differential equation. 3.3 Solution of differential equation 3.31 Variable separable form. 3.32 Homogeneous Differential Equations 3.33 Linear differential equation.	• Terminologies of differential equations. • Formation, order and degree of differential equations. • Methods of solution of differential equation

SW-3 Suggested Sessional Work (SW):

a. Assignments:

i Enumerate population growth using the concept of differential equations.

ii Use initial conditions to solve differential equations for engineering applications.

b. Mini Project:

i Prepare flow charts showing various methods for solving first order first-degree differential equations.

ii Prepare model showing the applications of differential equation for Newton's law of cooling.

iii Prepare models using the concept of differential equations for mixing problem.

c. Other Activities (Specify):

i Identify engineering problems based on real world with the use of free tutorials available on the Internet.

ii Use graphical software EXCEL, D-PLOT and GRAPH for applications of differential equations and related topics.

iii Use MATHCAD as mathematical tool to solve the problems of engineering related to differential equations.

iv Identify engineering problems related to differential equations.

CO-4 Utilize the concepts of numerical methods to solve given equations.

(Approx. Hrs: 07)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Determine the roots of given equations using Bisection method. SO4.2 Calculate the roots of given equations using Regula Falsi method. SO4.3 Compute the roots of given equations using Newton-Raphson method.		**Unit-4 Numerical Solutions of Equations** Introduction of algebraic and transcendental equations 4.1 Bisection method 4.2 Regula Falsi method 4.3 Newton Raphson method	• Roots of equations by Bisection Method • Roots of equations using Regula Falsi Method • Solution of equations using Newton-Raphson Method

SW-4 Suggested Sessional Work (SW):

a. Assignments:

i. Write algorithm to find the approximate roots of algebraic equations.
ii. Write algorithm to find the approximate roots of transcendental equations.

b. Mini Project:

i. Prepare graph showing the roots of algebraic equation.
ii. Prepare graph for finding the roots of equation by Regula falsi method.
iii. Prepare graph for finding the roots of equation by Newton-Raphson method
iv. Prepare a seminar on any relevant topic based on numerical method.
v. Identify suitable numerical methods for engineering related problems.

c. Other Activities (Specify):

i. Identify engineering problems based on real world problems with the use of free tutorials available on the Internet.
ii. Use graphical software EXCEL, D-PLOT and GRAPH for related topics.
iii. Use MATHCAD as mathematical tool to solve the given equations by numerical methods

CO-5 Measure the area using the concept of numerical integration for civil engineering.

(Approx. Hrs: 12)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 Apply the concept of Numerical integration to find area from given data by Trapezoidal rule SO5.2 Utilize the concept of Numerical integration to find area from given data by Simpson's one third rule SO5.3 Use the concept of Numerical integration to find area from given data by Simpson's three eighth rule.		**UNIT 5.0 Numerical Integration** Introduction to Numerical integration 5.1 Trapezoidal rule 5.2 Simpson's one third rule 5.3 Simpson's three eighth rule	• Integration by Trapezoidal rule. • Integration by Simpson's one-third rule. • Integration by Simpson's three eighth rule.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. Prepare chart showing the different formulas of numerical integration.
ii. Compare the results obtained by Trapezoidal and Simpson's rule for area related problems.
iii. Explore the role of numerical integration in engineering related problems.

a. Mini Project:

i Prepare a seminar on different methods of numerical integration.
ii Prepare a model showing the civil engineering applications of numerical integration.

b. Other Activities (Specify):

i Identify engineering problems based on real world problems with the use of free tutorials available on the Internet.
ii Use graphical software EXCEL, D-PLOT and GRAPH for related topics.
iii Seminar on applications of numerical integration.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESE of Classroom Instruction):

Unit Number	Unit Title	Marks Distribution			Total Marks
		R	U	A	
I	Integral Calculus	2	2	6	10
II	Applications of Integral Calculus	2	6	8	16
III	Differential equations of first order and first degree	2	6	8	16
IV	Numerical Solutions of Equations	2	2	6	10
V	Numerical Integration	2	6	10	18
Total		**10**	**22**	**38**	**70**

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESE of Laboratory Instruction*): NA

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)			
		Performance		Viva-Voce	
		PRA	PDA		
-	-	-	-	-	-

*Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practical ,

Legend: PRA: Process Assessment, PDA: Product Assessment

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Industrial visits
6. Industrial Training
7. Field Trips
8. Portfolio Based Learning
9. Role Play
10. Demonstration
11. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
12. Brainstorming
13. Others

L) Suggested Learning Resources:

(a) Books :

Sl. No.	Title	Author	Publisher	Edition & Year
1	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publ., New Delhi	2014, ISBN: 978-0-470-45836-5
2	Advanced Engineering Mathematics	H. K. Das	S. Chand & Co, New Delhi	ISBN: 9788121903455
3	Higher Engineering Mathematics	B. S. Grewal	Khanna Publ., New Delhi	2015, ISBN: 8174091955
4	Engineering Mathematics, Volume 1	S. S. Sastry	PHI Learning, New Delhi	2009, ISBN: 978-81-203-3616-2
5	A text book of Engineering Mathematics	Dutta, D	New age International publications, New Delhi	2006 ISBN: 978-81-24-1689-3
6	Getting Started with MATLAB-7	Pratap, Rudra	Oxford University Press, New Delhi,	2009 ISBN: 0199731241

(b) Open source software and website address:

1 www.scilab.org/ -SCI Lab
2-www.dplot.com/ -DPlot
3 www.allmathcad.com/ -MathCAD
4 www.wolfram.com/mathematica/ - MATHEMATICA
a. www.easycalculation.com

(c) Others:

1. Learning Packages.
2. Lab Manuals.
3. Manufacturers' Manual
4. Users' Guide

M) List of Major Laboratory Equipment and Tools: NA

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
-	-	-	-

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	Basic knowledge PO-1	Discipline knowledge PO-2	Experiments & Practice PO-3	Engineering Tools PO-4	The Engineer & Society PO-5	Environment & Sustainability PO-6	Ethics PO-7	Individual & Team work PO-8	Communication PO-9	Life Long learning PO-10	**PSO-1**	**PSO-2**
CO-1	√	√	√	-	-	-	-	√	√	√		
CO-2	√	√	√	-	-	-	-	√	√	√		
CO-3	√	√	√	-	-	-	-	√	√	√		
CO-4	√	√	√	-	-	-	-	√	√	√		
CO-5	√	√	√	-	-	-	-	√	√	√		

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title.	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO-1, 2,3,8,9,10 PSO---	CO-1 Solve the given problems of integration using suitable methods.	SO1.1 SO1.2 SO1.3 SO1.4		Unit-1.0 Integral Calculus 1.1, 1.2	1.1(a), 1.2(a)
PO-1, 2,3,8,9,10 PSO---	CO-2 Use the concept of integration to find area of given curves.	SO2.1 SO2.2 SO2.3 SO2.4		Unit-2.0 Applications of Integral Calculus 2.1,2.2	2.1(a), 2.1(b). 2.2(a)
PO-1, 2,3,8,9,10 PSO---	CO-3 Model the given engineering problems using the concept of differential equation.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5		Unit-3.0 Differential equations of first order and first degree 3.1,3.2,3.3	3.1(a), 3.2(a), 3.3(a)
PO-1, 2,3,8,9,10 PSO---	CO-4 Utilize the concepts of numerical methods to solve given equations.	SO4.1 SO4.2 SO4.3		Unit-4.0 Numerical Solutions of Equations 4.1, 4.2, 4.3	4.1(a), 4.2(a), 4.3(a)
PO-1, 2,3,8,9,10 PSO---	CO-5 Measure the area using the concept of numerical integration for civil engineering	SO5.1 SO5.2 SO5.3		Unit-5.0 Numerical Integration 5.1,5.2,5.3	5.1(a), 5.2(a), 5.3(a)

A) Course Code : 2000275(037)
B) Course Title : Applied Mechanics
C) Pre- requisite Course Code and Title :
D) Rationale :

Applied mechanics (Engineering mechanics) is a branch of the physical sciences that deals with the response of bodies (solids and fluids) or systems of bodies to external forces. To impart basic knowledge of Engineering Mechanics this course will help the student to develop basic know-how and awareness of the various laws of physics and it's real life applications in the various fields of engineering. After going through this course the student will be able to identify, convert and resolve real loads and couples into their theoretical counterparts. This course is a perquisite to 'strength of materials' and 'Theory of machines' courses in latter semesters.

E) Course Outcomes:

CO-1 Identify the force systems for different conditions using concepts of mechanics.

CO-2 Find the Centroid and Centre of gravity of various engineering components.

CO-3 Estimate force of friction in various conditions.

CO-4 Estimate velocities and accelerations in various linear and curvilinear motions.

CO-5 Calculate power, torque and energy associated with various engineering applications.

CO-6 Select suitable power transmission mode, simple lifting machine and estimate related parameters for various situations.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Mechanical Engineering	2000275 (037)	Applied Mechanics	2	-	1	3
2	Mechanical Engineering	2000290 (037)	Applied Mechanics (Lab)	-	2	-	1

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies),T- Tutorial includes Sessional Work(SW) (assignment, seminar, mini project etc.) and Self Learning(SL), C:Credits

Note: SW and SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning

G) Scheme of Assessment:

S.No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1.	Mechanical Engineering	2000275 (037)	Applied Mechanics	70	20	30	-	-	120
2.	Mechanical Engineering	2000290 (037)	Applied Mechanics (Lab)	-	-	-	30	50	80

Legend: ESE: End Semester Exam, CT: Class Test, TA: Teacher Assessment

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T- Tutorial Includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO-1 Identify the force systems for different conditions using concepts of mechanics.

(Approx. Hrs: L+P+T=08)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Explain basic terms related to mechanics. SO1.2 Identify the system of forces in the given situation with justification. SO1.3 Resolve and compose various forces acting on the given component. SO1.4 Identify the moment or couple acting in the given system with justification. SO1.5 Estimate forces and Couples acting on the given component.	LE1.1 Measure resultant force using law of Triangle of forces setup. LE1.2 Measure resultant force using law of Parallelogram of forces setup. LE1.3 Measure resultant force using law of Polygon of forces setup. LE1.4 Measure resultant force using Lami's Theorem using Jib crane setup. LE1.5 Use Funicular diagram to demonstrate Non-concurrent, Non-Parallel forces. LE1.6 Measure resultant moment using Law of Moments setup.	**Unit-1.0 Fundamentals and Resolution of Forces** 1.1 Definition of Mechanics, Statics, Dynamics- Kinetics, Kinematics. Concept of space, mass, particle, body, rigid body, scalar, vector, fundamental units, derived units. 1.2 Force- concept, definition, unit, graphical representation. 1.3 Concept of system of forces- non-coplanar, coplanar, concurrent, non-concurrent and parallel forces. 1.4 Composition and Resolution of forces. 1.5 Free body diagrams, law of parallelogram, Varignon's theorem. 1.6 Equilibrium of Coplanar concurrent forces, parallel forces and non-concurrent forces, Lami's Theorem. 1.7 Moment of a force and Couple, properties of couple, conditions of equilibrium, applications.	• Unit system. • Graphical method of Composition and resolution of forces.

SW-1 Suggested Sessional Work (SW):

- **Assignments:**
  i. Solve two problems related to law of triangle and law of polygon of forces (each).

- **Mini Project:**
  i. Select two stationary components from day to day life and try to identify all the forces acting on them in magnitude and direction.

- **Other Activities (Specify):**
  i. Draw free body diagram of 'hanging rod' of a ceiling fan in running condition.
  ii. Draw free body diagram of brake lever of a bike.
  iii. Estimate force exerted by your body on each leg of the chair/bench on which you are sitting.

CO-2 Find the Centroid and Centre of gravity of various engineering components.

(Approx. Hrs: P+L+T = 11)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Locate centroid of given regular plane and compound areas. SO2.2 Compute MI of a given plane areas. SO2.3 Use Perpendicular and Parallel Axis theorems to calculate MI about given axis of a given plane area.	LE2.1 Determine centroid of a given lamina of any shape using any computer aided drafting software. LE2.2 Determine M.I of a given lamina any shape using any computer aided drafting software.	**Unit-2.0 Centroid and Moment of Inertia** 2.1 Location of Centroid and Center of Gravity. 2.2 Centroid of regular plane and compound areas. 2.3 Center of Gravity of simple solids. 2.4 Moment of Inertia of plane areas. 2.5 Perpendicular and Parallel Axis theorems.	• Calculation of CG of solid body. • Calculation of M.I of solid body.

SW-2 Suggested Sessional Work (SW):

- **Assignments:**
  i. Find out Area Moment of Inertia of a solid circular wheel at the point of contact with road.
  ii. Find out Area Moment of Inertia of any rectangular shaped calendar at the point of hinge/suspension on the wall.
  iii. Locate CG and find out Area Moment of Inertia '30^{o}-60^{o} and 45^{o}-45^{o} solid Set Squares' used as drawing instruments about any side and hypotenuse.
  iv. Verify all above using MI calculation facility of any computer aided drafting software.

- **Micro Project:**
  i. Prepare a chart to show CGs locations of cross sections of different standard Mild steel pipe and rod sections available in the market.
  ii. Determine the location of CG of 'circle master' used as a drawing instrument.

- **Other Activities (Specify):**
  i. Prepare a list of at least five formulas related to Mechanical and Civil engineering in which use of area Moment of Inertia is required.

CO-3 Estimate force of friction in various conditions.

(Approx. Hrs: L+P+T= 14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Explain friction and related terms. SO3.2 Select coefficient of friction from data book for a given situation. SO3.3 Estimate coefficient of friction, angle of friction and angle of repose for given situation. SO3.4 Suggest ways to reduce friction.	LE3.1 Determine coefficient of friction for surfaces of different materials on a Horizontal Plane with given setup. LE3.2 Determine Coefficient of friction for surfaces of different materials with Inclined Plane apparatus.	**Unit-3.0 Friction** 3.1 Rough and Smooth surfaces, concept of friction. Types of friction, Coulomb's laws of friction 3.2 Co-efficient of friction, angle of friction, angle of repose. 3.3 Friction on horizontal and inclined plane, Method of reducing friction. 3.4 Screw and Nut friction, friction in journal Bearing	• Method of reducing friction. • Advantage and disadvantage of friction

SW-3 Suggested Sessional Work (SW) :

- **Assignments:**
  i. Solve numerical problems related to co-efficient of friction, angle of friction, angle of repose and force of friction in different situations.
- **Micro Project:**
  i. Prepare a list of engineering components where friction is desirable and undesirable also suggest ways to improve and reduce it respectively.
- **Other Activities (Specify):**
  i. Visit a nearby automobile workshop and collect details of the components and locations where oil and grease are applied to reduce the friction.

CO-4 Estimate velocities and accelerations in various linear and curvilinear motions.

(Approx. Hrs: L+P+T=15)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Compute velocity under the given uniform and non-uniform acceleration situation. SO4.2 Describe Newton's Laws of Motion with examples. SO4.3 Calculate force and momentum in the given situation.	LE4.1 Plot Velocity -Time diagrams for different combinations of Uniform and non uniform velocities.	**Unit 4.0 Kinematics and Kinetics** 4.1 Kinematics in Cartesian and polar coordinates. Concept of speed, velocity, acceleration, radial and transverse velocity, 4.2 Particle under uniform and non-uniform acceleration, tangential and normal acceleration. 4.3 Angular displacement, Angular Velocity, Angular Acceleration. 4.4 Motion under gravity. 4.5 Kinetics of particle, motion under constant force, Newton's Laws of Motion. 4.6 Momentum and energy principles, Impulses and angular momentum.	• Velocity profile

SW-4 Suggested Sessional Work (SW):

- **Assignments:**
  i. Solve numerical problems related to velocity and acceleration
  ii. Solve numerical problems related to force and impulse.

- **Micro Project:**
  i. Collect information on engineering components/members subjected to tangential and normal acceleration and prepare a report.

- **Other Activities (Specify):**
  i. Calculate how much force is required to push a stationary Bicycle, Bike and Car and compare it. If we reduce the width of the car tires will the force reduces? Please comment.
  ii. Check how much gradually applied weight is required to press a nail in a wooden board and then compare the same with the weight of the hammer normally used to do the same thing. Please comment on why less weight hammer is capable of doing the same thing.

CO- 5 Calculate power, torque and energy associated with various engineering applications.

(Approx. Hrs: L+P+T=13)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 Define work, power, energy and their units of measurement SO5.2 Calculate IHP and BHP in the given condition. SO5.3 Calculate Kinetic and Potential energy of an object from the given data. SO5.4 Establish relation between Work, Power and Energy.	LE5.1 Use dynamometer to calculate power in any rotating shaft/drum/pulley/wheel. LE5.2 Use tachometer to calculate speed of any rotating shaft/drum/pulley/wheel.	**Unit-5.0 Work, Power and Energy** 5.1 Work- Definition and unit of work done, force displacement diagram, torque, work done by torque. 5.2 Power-Definition and unit of Power, I.H.P and B.H.P of engine, Equation of H.P in terms of Torque and R.P.M. 5.3 Energy- Definition and units of Energy, Kinetic and Potential energy. 5.4 Relation between Heat and Mechanical work, relation between Electrical and Mechanical energy	• Torque

SW-5 Suggested Sessional Work (SW) :

- **Assignments:**
  i. Solve problems related to work, power and energy in different domestic and industrial situations.
  ii. Solve numerical problem based on work done by force and torque.
  iii. Solve numerical problem based on computation of IHP and BHP of engines.
  iv. Solve numerical problem based on computation of Kinetic and Potential energy
  v. Convert motor or engine horse power into watts/kilo watts
  vi. In 'Electricity Bill' one UNIT consumption represents what?
- **Micro Project:**
  i. Visit different labs of your institute and collect data related to power, torque and RPM of various actuators like electric motors and engines.
  ii. In case of Electric motors and Batteries calculate electric power it can supply.
  iii. Collect data of IHP and BHP related to two Bikes, Cars, Jeeps and Buses (each) of your locality.
- **Other Activities (Specify):**
  i. Collect information on electric cars related to its battery power and correlate it theoretically to the torque and rpm available at wheel if the car is running at 30km/hr.

CO-6 Select suitable power transmission mode, simple lifting machine and estimate related parameters for various situations.

(Approx. Hrs: L+P+T= 19)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO6.1 Describe Load, Effort, Mechanical advantage, Velocity ratio, Efficiency SO6.2 Compute Mechanical advantage, Velocity ratio, Efficiency of the given simple machine. SO6.3 Select suitable power transmission mode for the given situation.	LE6.1 Estimate Mechanical advantage, Velocity Ratio and Efficiency for Simple Screw Jack setup. LE6.2 Estimate Mechanical advantage, Velocity Ratio and Efficiency for Differential Wheel and Axle setup. LE6.3 Demonstration of use of inclined plane as a lifting machine. LE6.4 Estimate Velocity Ratio for a belt-pulley system, simple gear train, worm and worm wheel.	**Unit-6.0 Simple Lifting Machines and Transmission of power** 6.1 Load, Effort, Mechanical advantage, Velocity ratio, Efficiency and relation between them. 6.2 Law of Machine, Reversibility of Lifting machine. 6.3 Study of Machines- Differential wheel and axel, Simple Screw Jack, Pulley block, System of pulleys, Simple and compound levers. 6.4 Transmission of power through Belt (flat belt, V-belt, Timer belt), Rope, Gears (Spur, Helical, worm and worm wheel, rack and pinion) and Gear trains (simple, compound, epycyclic): terminology, classification, salient features, area of application, velocity ratio and efficiency.	• Study of single and double purchase winch crab machine.

SW-6 Suggested Sessional Work (SW):

- **Assignments:**
  i. Solve numerical problem based on computation of Mechanical advantage, Velocity ratio, Efficiency of simple machines.
  ii. Solve numerical problem based on law of machine.

- **Mini Project:**
  i. Visit different labs of your institute or nearby workshop and collect information about various transmission modes used and related data. Estimate velocity ratio in each case and justify its use in that particular situation.
  ii. Visit a nearby automobile repair shop and list the types of gears used in a bike/moped/scooter.

- **Other Activities (Specify):**
  i. Prepare a report on application of timer belt and pulley through internet.
  ii. List the devices in which epicylic gear trains are used.
  iii. Collect the photographs and details of different types of lifting jacks are available in market for lifting and car.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

A) Suggested Specification Table (For ESE of Classroom Instruction):

Unit Number	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
I	Fundamentals and Resolution of Forces	2	2	3	7
II	Centroid and Moment of Inertia	3	4	5	12
III	Friction	2	4	6	12
IV	Kinematics and Kinetics	3	4	5	12
V	Work, Power and Energy	3	4	5	12
VI	Simple Lifting Machines and Transmission of Power	4	5	6	15
Total		**17**	**23**	**30**	**70**

Legend: R: Remember, U: Understand, A: Apply and above

B) Suggested Specification Table (For ESE of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Titles	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE1.1	Measure resultant force using law of Triangle of forces setup.	15	10	5
LE1.2	Measure resultant force using law of Parallelogram of forces setup.	15	10	5
LE1.3	Measure resultant force using law of Polygon of forces setup.	15	10	5
LE1.4	Measure resultant force using Lami's Theorem using Jib crane setup.	15	10	5
LE1.5	Use Funicular diagram to demonstrate Non-concurrent, Non-Parallel forces.	15	10	5
LE1.6	Measure resultant moment using Law of Moments setup.	15	10	5
LE2.1	Determine C.G. of a given lamina of any shape using any computer aided drafting software.	15	10	5
LE2.2	Determine M.I of a given lamina any shape using any computer aided drafting software.	15	10	5
LE 3.1	Determine coefficient of friction for surfaces of different materials on a Horizontal Plane with given setup.	15	10	5

LE 3.2	Determine coefficient of friction for surfaces of different materials with Inclined Plane apparatus.	15	10	5
LE4.1	Plot Velocity -Time diagrams for different combinations of Uniform and non uniform velocities.	15	10	5
LE5.1	Use dynamometer to calculate power in any rotating shaft/drum/pulley/wheel.	15	10	5
LE5.2	Use tachometer to calculate speed of any rotating shaft/drum/pulley/wheel.	15	10	5
LE6.1	Estimate Mechanical advantage, Velocity Ratio and Efficiency for Simple Screw Jack setup.	15	10	5
LE6.2	Estimate Mechanical advantage, Velocity Ratio and Efficiency for Differential Wheel and Axle setup.	15	10	5
LE6.3	Demonstration of use of inclined plane as a lifting machine.	15	10	5
LE6.4	Estimate Velocity Ratio for a belt-pulley system, simple gear train, worm and worm wheel.	15	10	5

*Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals ,

Legend: PRA: Process Assessment, PDA: Product Assessment

Note: Only one experiment has to be performed at the End Semester Examination of 30 marks as per assessment scheme.

C) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Industrial visits
6. Industrial Training
7. Field Trips
8. Portfolio Based Learning
9. Role Play
10. Demonstration
11. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
12. Brainstorming
13. Others

D) Suggested Learning Resources:

(a) Books :

S.No.	Titles	Author	Publisher and Edition*
1	Applied Mechanics	Khurmi, R.S.	S.Chand & Co. New Delhi 2014 ISBN: 9788121916431
2	Applied Mechanics	S.S.L Patel	Dhanpat Rai & Company
3	Foundations and Applications of Applied Mechanics	Ram, H. D.; Chauhan, A. K.	Cambridge University Press, Thomson Press India Ltd., New Delhi, 2015, ISBN: 9781107499836
4	Engineering Mechanics-Statics, Vol. I	Meriam, J. L.; Kraige, L.G.	Wiley Publication, New Delhi, ISBN: 978-81-265-4396
5	Engineering Mechanics	Ramamrutham, S.	S Chand & Co. New Delhi 2008 ISBN:9788187433514

*Latest edition of all above books should be referred

(b) Open source software and website address:

1. http://www.asnu.com.au
2. www.youtube.com for videos regarding machines and applications, friction
3. www.nptel.ac.in
4. www.discoveryforengineers.com

(c) Others:

1. Learning Packages
2. Users' Guide
3. Manufacturers' Manual
4. Lab Manuals

E) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1.	Differential axle and wheel	Differential axle and wheel (wall mounted unit with the wheel of 40 cm diameter and axles are insteps of 20 cm and 10 cm reducing diameter .	LE6.2
2.	Universal Force Table	Universal Force Table (Consists of a circular 40 cm dia. Aluminum disc, graduated into 360 degrees.) with all accessories.	LE1.1, LE1.2, LE1.3,
3.	Jib crane setup.	Jib crane setup.	LE1.4
4.	Law of moments apparatus	Law of moments apparatus consisting of a stainless steel graduated beam 12.5 mm square in section, 1m long, pivoted at centre.	LE1.6
5.	Beam Reaction apparatus	Beam Reaction apparatus (The apparatus is with two circular dial type 10 kg.	LE1.1
6.	Models of geometrical figures.	Acrylic models of standard geometrical figures.	LE2.1,LE2.2

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
7.	Latest educational version of AutoCAD software	Latest educational version of AutoCAD software	LE2.1,LE2.2
8.	Friction apparatus	Friction apparatus for motion along horizontal and inclined plane (base to which a sector with graduated arc and vertical scale is provided. The plane may be clamped at any angle up to 45 degrees. pan. Two weight boxes (each of 5 gm,10 gm, 2-20 gm, 2-50 gm, 2-100 gm weight),	LE 3.1, LE 3.2, LE6.3
9.	Dynamometer and Tachometer	Dynamometer and Tachometer	LE5.1, LE5.2
10.	Simple screw Jack	Simple screw Jack (Table mounted metallic body , screw with a pitch of 5 mm carrying a double flanged turn table of 20 cm diameter.	LE6.1
11.	Worm and worm wheel	Worm and worm wheel (wall mounted unit with threaded spindle, load drum, effort wheel; with necessary slotted weights, hanger and thread)	LE6.4
12.	Single Purchase Crab winch	Single Purchase Crab winch (Table mounted heavy cast iron body. The effort wheel is of C.I. material of 25 cm diameter mounted on a shaft of about 40mm dia. On the same shaft a geared wheel of 15 cm dia.	LE6.1 to LE6.4
13.	Double Purchase Crab winch	Double Purchase Crab winch (Having assembly same as above but with double set of gearing arrangement.)	LE6.2
14.	Weston's Differential pulley block	Weston's Differential pulley block (consisting of two pulleys; one bigger and other smaller.	LE6.2
15.	Weston's Differential worm geared pulley block	Weston's Differential worm geared pulley block (Consists of a metallic (preferably steel) cogged wheel of about 20 cm along with a protruded load drum of 10 cm dia to suspend the weights of 10 kg, 20 kg-2 weights and a 50 kg weights)	LE6.2

F) Mapping of POs and PSOs with COs:

Course Outcomes (COs)		Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)		
		PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Experiments and practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2	PSO-3
CO-1	Identify the force systems for different conditions using concepts of mechanics.	2	3	3	2	1	1	1	2	2	2	-	2	-
CO-2	Find the Centroid and Centre of gravity of various engineering components.	3	2	1	2	1	1	1	2	2	2	2	1	1
CO-3	Estimate force of friction in various conditions.	3	2	2	1	1	1	1	2	2	2	-	2	1
CO-4	Estimate velocities and accelerations in various linear and curvilinear motions.	2	2	2	1	1	1	1	2	2	2	1	2	1
CO-5	Calculate power, torque and energy associated with various engineering applications.	2	3	2	2	1	1	1	2	2	3	-	2	1
CO-6	Select suitable power transmission mode, simple lifting machine and estimate related parameters for various situations.	2	3	3	2	1	1	1	2	2	3	-	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

G) Course Curriculum Map:

POs & PSOs No.	COs No. & Titles	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 PSOs - 2	CO-1 Identify the force systems for different conditions using concepts of mechanics.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LE1.1 LE1.2 LE1.3 LE1.4 LE1.5 LE1.6	Unit-1.0 Fundamentals and Resolution of Forces 1.1,1.2,1.3,1.4,1.5, 1.6, 1.7	As mentioned in relevant pages
PO - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 PSOs – 1, 2, 3	CO-2 Find the Centroid and Centre of gravity of various engineering components.	SO2.1 SO2.2 SO2.3	LE2.1 LE2.2	Unit-2.0 Centroid and Moment of Inertia 2.1, 2.2 ,2.3, 2.4, 2.5	
PO - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 PSOs – 2, 3	CO-3 Estimate force of friction in various conditions.	SO3.1 SO3.2 SO3.3 SO3.3	LE3.1 LE3.2 LE3.3	Unit-3.0 Friction 3.1, 3.2, 3.3, 3.4	
PO - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 PSOs - 1, 2, 3	CO-4 Estimate velocities and accelerations in various linear and curvilinear motions.	SO4.1 SO4.2	LE4.1	Unit-4.0 Kinematics and Kinetics 4.1, 4.2, 4.3, 4.2, 4.4, 4.5, 4.6	
PO - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 PSOs – 2, 3	CO-5 Calculate power, torque and energy associated with various engineering applications.	SO5.1 SO5.2 SO5.3 SO5.4	LE5.1 LE5.2	Unit-5.0 Work, Power and Energy 5.1, 5.2, 5.3, 5.4	
PO - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 PSOs – 2, 3	CO-6 Select suitable power transmission mode, simple lifting machine and estimate related parameters for various situations.	SO6.1 SO6.2 SO6.3	LE6.1 LE6.2 LE6.3 LE6.4	Unit-6.0 Simple Lifting Machines and Transmission of power 6.1, 6.2, 6.3, 6.4	

A) Course Code : 2000278(011)

B) Course Title : Applied Chemistry

C) Pre- requisite Course Code and Title :

D) Rationale :

Diploma engineers have to deal with various materials. The study of concepts of chemistry and application parts from applied chemistry like atomic structures, chemical bonding, water treatment and analysis, electrochemistry and batteries, metals, alloys, insulators, fuels and combustion will help in understanding the technology courses where emphasis is laid on the applications of these concepts and principles in different technology applications. This course is designed by which fundamental information will help the technologists to apply the basic concepts and principles of chemistry to solve broad-based problems.

E) Course Outcomes:

CO-1 Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.

CO-2 Use relevant water treatment method to solve industrial problems.

CO-3 Solve the engineering problems using concept of Electrochemistry.

CO-4 Solve the engineering problems by applying the knowledge of metallurgical process and Metals Alloys.

CO-5 Use relevant fuel and lubricants for industrial applications.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Applied Science	2000278 (011)	Applied Chemistry	2	-	1	3
2	Applied Science	2000291 (011)	Applied Chemistry (Lab)	-	2	-	1

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies),T- Tutorial includes Sessional Work(SW) (assignment, seminar, mini project etc.) and Self Learning(SL), C:Credits

Note: SW and SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning

G) Scheme of Assessment:

S.No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Applied Science	2000278 (011)	Applied Chemistry	70	20	30	-	-	120
2	Applied Science	2000291 (011)	Applied Chemistry (Lab)	-	-	-	30	50	80

Legend: ESE: End Semester Exam, CT: Class Test, TA: Teacher Assessment

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T- Tutorial Includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO-1 Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding. (Approx. Hrs:L+P+T=14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Determine the electronic structure of the given atom for the material used in industry. SO1.2 Calculate the quantum numbers for various energy levels of industrially applicable metals. SO1.3 Use theory of chemical bonding for identification of different properties material used in the industries.	--	**Unit-1.0 Atomic Structure and Chemical Bonding** 1.1 Atomic Structure 1.1.1 Electronic structure of atoms, 1.1.2 Discovery of electrons, protons and neutrons. 1.1.3 Rutherford model and Bohr's – Burry scheme of distributions of electrons. 1.1.4 Heisenber's uncertainty principle, 1.1.5 Quantum numbers, sub energy level 1.1.6 Distribution of electrons in sub-shells and concept of Electronic configuration of atoms, 1.1.7 Auffbaus's rule, 1.1.8 Pauli's exclusion principle. 1.1.9 Hund's rule of maximum multiplicity. 1.2 Chemical Bonding 1.2.1 Theory of Chemical Bonding, 1.2.2 Types of Bonds, a. Ionic or electrovalent bonds, b. Covalent bond, c. coordination bond, d. Hydrogen bonding.	• Discovery of electrons, protons and neutrons.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

i. Write electronic structure of the given atoms.

b. Mini Project:

i. Prepare Rutherford model and Bohr's – Burry models.

ii. Create element cards with different elements showing covalent and ionic bonds.

c. Other Activities (Specify):

i. Seminar on Quantum numbers.

CO-2 Use relevant water treatment method to solve industrial problems.

(Approx. Hrs:L+P+T=18)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Perform water softening for the industrial hard water. SO2.2 Use the relevant water treatment method for municipal water. SO2.3 Differentiate Natural and Synthetic Rubbers.	LE2.1 Determine total hardness, temporary hardness and permanent hardness of water sample by EDTA method. LE2.2 Determine the alkalinity of given water sample. LE2.3 Determine the turbidity in given water sample by Nephelometric method. LE2.4 Determine the total dissolved and suspended solids in given water sample. LE2.5 Determine the biological oxygen demand in the given water sample.	**Unit-2.0 (A) Water Treatment** 2.1 Hardness 2.1.1 Types of Hardness 2.1.2 Determination of hardness using EDTA method 2.2 Hard water 2.3 Boiler Problems 2.3.1 Boiler corrosion 2.3.2 caustic embrittlement 2.3.3 priming and foaming, 2.3.4 scales and sludges 2.4 Water softening: 2.4.1 lime soda process a. Hot lime soda process b. Cold lime soda process, 2.4.2 Zeolite process, 2.4.3 Iion exchange process a. Cation exchange b. Anion exchange 2.5 Municipal Water Treatment, 2.5.1 Sedimentation 2.5.2 Coagulation 2.5.3 Filtration 2.5.4 Sterilization 2.6 BOD &COD	• Hardness • Types of Hardness

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
		Unit-2.0 (B) Polymer 2.1 Classification of polymer 2.1.1 Types of rubber 2.1.2 Natural and, synthetic, 2.1.3 Processing of natural rubber. Synthetic rubber 2.1.4 Properties and applications of Buna-N, Thiokol, Neoprene.	

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

i. Prepare model to find the soap foaming capacity of bore water on addition of soda ash.

b. Mini Project:

i. Collect water samples from different water sources and find the characteristics like acidity, conductivity, dissolved solids, suspended particles.
ii. Collect 3 to 5 water samples to find the dosage of bleaching powder required for its sterilization.

c. Other Activities (Specify):

i. Seminar on impurities in municipal water Conduct a seminar on " ".
ii. Visit the municipal water treatment plant.
iii. Visit the DM water plant.

CO-3 Solve the engineering problems using concept of Electrochemistry.

(Approx. Hrs:L+P+T=18)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Describe the factors affecting of Conductance. SO3.2 Explain Electrical conductance in metals and Electrolytes SO3.3 Describe the different types of Electrodes & Batteries. SO3.4 Define Electrical Insulator and its classification	LE3.1 Determine the conductance of the given solution by conductometric titration. LE3.2 Determine the variation of conductance with temperature for the given Electrolytes. LE3.3 Determine the conductivity of given water sample. LE3.4 Determine the pH for given solution using glass electrode. LE3.5 Determine the voltage generated from chemical reaction using Daniel Cell.	**Unit-3.0 (A) Electrochemistry and Batteries** 3.1 Conductance: 3.1.1 Nature of solute, 3.1.2 Nature of solvent, 3.1.3 Temperature, 3.1.4 Concentration or dilution. 3.2 Electrical conductance in metals and electrolytes, 3.2.1 specific conductance, 3.2.2 equivalent conductance, 3.2.3 cell constant. 3.3 Electrodes: 3.3.1 Hydrogen electrode, 3.3.2 calomel electrode 3.3.3 glass electrode 3.4 Conductometric Titration 3.5 Batteries 3.5.1 Type of batters with examples 3.5.2 Primary battery **3.5.3** Secondary battery **Unit-3.0 (B) Electrical Insulator and thermocouple alloy** 3.1 Electrical insulators: 3.1.1 Classification and example 3.2 Thermocouple alloy: Composition and characteristics 3.2.1 platinum /rhodium, 3.2.2 tungsten/ rhenium,	Conductance: • Nature of solute, • Nature of solvent, • Temperature, • Concentration or dilution.

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

i. Prepare the chart displaying working process of lithium ion and Ni & Cd batteries.

ii. Prepare the model, expressing the working process of fuel cell.

iii. Prepare chart showing properties of Thermocouple alloy.

b. Mini Project:

i. Collect the samples of different types of electrodes used in various batteries and prepare a report on their conductance.
ii. Prepare the working model of Daniel cell and calculate the current flow by Daniel cell.
iii. Collect the sample of alloying elements like Pt, Ni, W, Fe and prepare a report of their effectson the properties of thermocouple Alloy.

c. Other Activities (Specify):

i. Organize quiz on Electric Conductivity.
ii. Organize quiz on metal insulators.

CO-4 Solve the engineering problems by applying the knowledge of metallurgical process and Metals Alloys.

(Approx. Hrs:L+P+T=14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Extract the ore from chemical reaction for industrial application SO4.2 Prepare the metal alloy for industrial application. SO4.3 Use the Refractory material for industrial applications. .	LE4.1 Determine the percentage of copper in given copper ore. LE4.2 Standardization of $KMnO_4$ solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by $KMnO_4$ solution.	**Unit- 4.0 (A) Metallurgy** 4.1 Metallurgy: 4.1.1 Mineral, 4.1.2 Ore, 4.1.3 Gangue, 4.1.4 Flux, 4.1.5 Slag. 4.2 Metallurgical process of iron and copper **Unit- 4.0 (B) Metal Alloys** 4.1 Properties of metals like copper, aluminum, tungsten, platinum nickel. 4.2 Ferrous alloys: 4.2.1 Low carbon 4.2.2 Medium carbon 4.2.3 High carbon steels. 4.3 Non-ferrous alloy: 4.3.1 Brass, 4.3.2 Bronze, 4.3.3 Duralumin, 4.3.4 Tinman Solder 4.3.5 Woods metal **Unit-4.0 (C) Cement:** 4.1 Portland cement, 4.1.1 Constituent 4.1.2 Setting and Hardening.	• Properties of metals like copper, aluminum, tungsten, platinum nickel.

SW-4 Suggested Sessional Work (SW) :

a. Assignments:

i. Prepare chart showing properties of refractory materials.

ii. Prepare chart showing different industrial application of metal and relate it with required property or properties using internet.

iii. Prepare chart of showing percentage composition, properties and industrial applications of different types of steel based on above alloying elements using internet.

b. Mini Project:

i. Collect different samples of cement and find their initial and final setting time**.**

ii. Find the effect of alloying elements like Mn, Cr, Ni, W, V, Co on properties of steel.

c. Other Activities (Specify):

i. Organize quiz on metal properties, Alloy and ores.

ii. Visit Metal industries to learn metallurgy process.

CO- 5 Use relevant fuel and lubricants for industrial applications.

(Approx. Hrs:L+P+T=16)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 Select the relevant fuel for industrial applications. SO5.2 Test the quality of coal for industrial uses. SO5.3 Perform fractional distillation process for refining of petroleum in industries. SO5.4 Test the properties of the given lubricant for industrial applications. SO5.5 Identify the different ingredients of paints and varnish for engineering	LE5.1 Determine the moisture content, ash and volatile matter in given coal sample using proximate analysis. LE5.2 Determine the calorific value of the given solid fuel using Bomb calorimeter. LE5.3 Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer –I LE5.4 Determine the flash and fire point of given lubricating oil using Cleavland open cup apparatus. LE5.5 Determine the cloud and pore point of the given lubricant. LE5.6 Separate the various	**Unit-5.0 (A) Fuel and Combustion** 5.1 Fuel: Calorific value and ignition temperature, classification. 5.2 Solid fuels: Coal, Classification and composition , 5.2.1 Proximate analysis, 5.2.2 Ultimate analysis, 5.2.3 Bomb calorimeter. 5.2 4 Carbonization of coke by Otto Hofmann's oven. 5.3 Liquid fuels: 5.3.1 Fractional distillation of crude petroleum, 5.3.2 Boiling range, 5.3.3 Composition and properties. 5.3.4 Knocking, 5.3.5 Cracking,	• Classification of fuel. • Solid fuel classification. • Octane number and Cetane number.

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
applications.	fractions of the given sample of petroleum using fractional distillation.	5.3.6 Octane number and Cetane number. 5.4 Gaseous fuels: 5.4.1 Biogas, LPG, and CNG. 5.4.2 Combustion equation of gaseous fuels, **Unit 5.0 (B) Lubricants, Paints and Varnishes** 5.1 Lubricant- 5.1.1 Types, a. Liquid b. Solid c. Semisolid 5.1.2 Theory of lubrication, 5.1.3 Properties of a good lubricants 5.1.4 Flash and Fire point, 5.1.5 Pour paint and cloud point. 5.1.6 Specification number and viscosity, 5.2 Paints and Varnish 5.2.1 Constituents, 5.2.2 Properties and uses.	

SW-5 Suggested Sessional Work (SW) :

a. Assignments:

i. Prepare chart showing different types of liquid fuels their calorific values and uses.
ii. Prepare a chart differentiating proximate and ultimate analysis of Coal.
iii. Prepare the comparative chart of commercially available lubricants on the basis of mechanism of lubrication.
iv. Prepare the chart displaying applications of different paints and Varnish.

b. Mini Project:

i. Prepare a report on effect of LPG and CNG on environment
ii. Collect the sample of various lubricants and prepare the report about properties and uses.

c. Other Activities (Specify):

i. Seminar on combustion of gaseous fuel.
ii. Visit the paint industry.

I) Suggested Specification Table (For ESE of Classroom Instruction):

Unit Number	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
I	Atomic Structure and Chemical Bonding	**6**	**5**	**3**	**14**
II	Water Treatment and Polymer	**3**	**4**	**7**	**14**
III	Electrochemistry, Batteries, Insulator and Electrical Thermocouple	**6**	**4**	**4**	**14**
IV	Metallurgy, Metal Alloys and Cements	**3**	**5**	**6**	**14**
V	Fuel and Combustion, Lubricants, Paints Varnish	**6**	**3**	**5**	**14**
Total		**24**	**21**	**25**	**70**

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESE of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Titles	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE2.1	Complexometric Titration	15	10	5
LE2.2	Alkalinity	15	10	5
LE2.3	Turbidity	15	10	5
LE2.4	TDS & SS	20	05	5
LE2.5	BOD	12	13	5
LE3.1	Conductometric titration	15	10	5
LE3.2	Conductometer	17	08	5
LE3.3	Conductometer	18	07	5
LE3.4	pH meter	16	09	5
LE3.5	Daniel cell	15	10	5
LE4.1	Percentage of Cu	16	09	5
LE4.2	Percentage of Fe	16	09	5
LE5.1	Proximate analysis	15	10	5
LE5.2	Bomb calorimeter	15	10	5
LE5.3	Redwood viscometer-I	16	09	5
LE5.4	Cleaveland open cup	16	09	5
LE5.5	Cloud and pore point	16	09	5
LE5.6	Fractional distillation	15	10	5

* Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals ,

Legend : PRA: Process Assessment, PDA : Product Assessment

Note: Only one experiment has to be performed at the end semester examination of **30 Marks** as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Industrial visits
6. Industrial Training

7. Field Trips
8. Portfolio Based Learning
9. Role Play
10. Demonstration
11. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)
12. Brainstorming
13. Others

L) Suggested Learning Resources:

(a) Books :

S. No.	Titles	Author	Publisher	Edition & Year
1	Engineering Chemistry	Agarwal, Shikha	Cambridge university press ; New Delhi,	2015
2	Engineering Chemistry	Dara, S. S. and Dr.S.S.Umare	S.Chand. Publication, New Delhi,	2015
3	Engineering Chemistry	Jain & Jain	Dhanpat Rai and sons; New Delhi	2015
4	Engineering Chemistry	Dr.Vairam, S.	Wiley India Pvt.Ltd., New Delhi\	2013
5	Chemistry for engineers	Agnihotri, Rajesh	Wiley India Pvt.Ltd.	2014

(b) Open source software and website address :

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5. www.chem1.com/acad/webtext/elchem/ec6.html (Electrochemistry and batteries)
6. www.em-ea.org/guide%20books/book 2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
7. www.chemcollective.org (Metals, Alloys)
8. www.wqa.org(Water Treatment)

(c) Others:

1. Learning Packages.
2. Lab Manuals.
3. Manufacturers' Manual
4. Users' Guide

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipments	Broad Specifications	Relevant Experiment Number
1	Electronic balance,	scale range of 0.001g to 500g. pan size 100 mm; response time 3-5 sec.; power requirement 90-250 V, 10 watt.	All
2	Nephelometer	Auto-ranging from 20-200 NTU,+/- 2% of reading plus 0.1 NTU, power 220 Volts +/- 10% AC 50 Hz.	LE 2.3
3	Conductometer	Range 0-199.9ms; resolution 0.1ms/0.01ms/0.001ms/0.1µs/0.01µs; accuracy ±0.5% ±2 digits	LE3.2
4	pH meter	Working range 0-14; resolution 0.1/0.01 pH; temperature compensation 0-100^0 C	LE3.4
5	Electric oven	inner size 18''x18''x18''; temperature range 100 to 250^0 C. with the capacity of 40lt.	LE 5.1
6	Muffle furnace,	Temperature up to 900^{0}C, digital temperature controller with an accuracy of +/- 3^{0}C	LE 5.1
7	Bomb calorimeter	Measurement unit J/kg, cal/gm, BTU/Ib; temp. resolution 0.0001^{0}C or better; combustion bomb-halogen and acid resistant stabilized stainless steel; resolution 0.001kcal/gm; measurement range up to 40,000 J/gm	LE 5.2
8	Redwood viscometer-1	Suitable to operate at 220 volts AC mains with tap ; stainless steel jet; cup cover; thermometer ;electronic digital indicator ; controller etc	LE5.3
9	Cleavland open cup apparatus	Energy regulator-to regulate the rate of rise in temperature; 220V; 50 Hz; single phase; AC supply	LE5.4
10	Cloud and pore point apparatus	Energy regulator ,to regulate the rate of rise in temperature,200V,50Hz, single phase,AC supply etc.	LE 5.5
11	Fractional distillation assembly	Capacity 1.5 lt.	LE 5.6

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Experiments and practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2
CO-1 Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.	3	1	1	-	-	-	1	2	2	1	-	1
CO-2 Use relevant water treatment method to solve industrial problems.	3	1	3	3	2	2	1	3	1	2	1	1
CO-3 Solve the engineering problems using concept of Electrochemistry	3	1	2	2	1	2	-	3	2	2	-	1
CO-4 Solve the engineering problems by applying the knowledge of metallurgical process and Metals Alloys	3	1	3	3	-	2	-	3	1	2	1	1
CO-5 Use relevant fuel and lubricants for industrial applications.	3	1	3	2	1	1	-	2	1	2	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Titles	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO-1,2,3,7,8,9,10 PSO-2	CO-1 Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.	SO1.1 SO1.2 SO1.3		Unit-1.0 Units , Atomic Structure and Chemical Bonding 1.1 , 1.2	As mentioned in relevant pages
PO-1,2,3,4,5,6, 7,8,9,10 PSO-1,2	CO-2 Use relevant water treatment method to solve industrial problems.	SO2.1 SO2.2 SO2.3	LE2.1 LE2.2 LE2.3 LE2.4 LE2.5	Unit-2.0 (A) Water Treatment 2.1, 2.2, 2.3, 2.4, 2.5, 2.6 Unit-2.0 (B) Polymer 2.1, 2.2, 2.3, 2.4	
PO-1,2,3,4,5,6, 8,9,10 PSO-2	CO-3 Solve the engineering problems using concept of Electrochemistry	SO3.1 SO3.2 SO3.3 SO3.4	LE3.1 LE3.2 LE3.3 LE3.4 LE3.5	Unit-3.0 (A) Electrochemistry and batteries 3.1, 3.2, 3.3 Unit-3.0 (B) Electrical Insulator and thermocouple alloys 3.1, 3.2	
PO-1,2,3,4,6, 8,9,10 PSO-1,2	CO-4 Solve the engineering problems by applying the knowledge of metallurgical process and Metals Alloys**.**	SO4.1 SO4.2 SO4.3	LE4.1 LE4.2	Unit-4.0 (A) Metallurgy 4.1, 4.2 Unit-4.0 (B) Metal alloys 4.1, 4.2, 4.3 Unit-4.0 (C) Cement 4.1	
PO-1,2,3,4,5, 6,8,9,10 PSO-1,2	CO-5 Use relevant fuel and lubricants for industrial applications.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	LE5.1 LE5.2 LE5.3 LE5.4 LE5.5 LE5.6	Unit-5.0 (A) Fuel and Combustion 5.1, 5.2 , 5.3, 5.4 Unit-5.0 (B) Lubricants paints and varnishes 5.1, 5.2	

A) Course Code : 2000277(037)

B) Course Title : Engineering Drawing

C) Pre- requisite Course Code and Title :

D) Rationale :

Engineering Drawing is a language of engineers that enables them to visualize the ideas converting to realization by drawing them. It helps in communicating the shape, size, finish, color and construction of any object and aids in improving the concepts, imagination and visualization power of an engineer. It is a graphical language that communicates all the information about an object from an engineer, who designed it, to an artisan who will make it. This course aims at developing the ability to draw and read various scales, engineering curves, projection of line point and plane, isometric projection and introduces the application of Computer aided drafting software like AutoCAD software for drafting of engineering drawings thereby building the foundation for digital drawing environment for further courses related engineering drawing.

E) Course Outcomes:

CO-1 Use drawing instruments, scales, and standard norms to create drawings.

CO-2 Draw various engineering curves.

CO-3 Draw the projection of points, lines and planes with different conditions.

CO-4 Interpret and draw the orthographic and sectional views of an object.

CO-5 Develop isometric view from orthographic views of objects.

CO-6 Use computer aided drafting software to draw 2D geometric entities.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Mechanical Engineering	2000277 (037)	Engineering Drawing	2	-	1	3
2	Mechanical Engineering	2000292 (037)	Engineering Drawing (Practical)	-	2	-	1

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), T- Tutorial includes Sessional Work (SW) (assignment, seminar, mini project etc.) and Self Learning (SL), C: Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning

G) Scheme of Assessment:

S.No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Mechanical Engineering	2000277 (037)	Engineering Drawing	70	20	30	-	-	120
2	Mechanical Engineering	2000292 (037)	Engineering Drawing (Practical)	-	-	-	30	50	80

Legend: ESE: End Semester Exam, CT: Class Test, TA: Teacher Assessment

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T- Tutorial Includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO-1 Use drawing instruments, scales, and standard norms to create drawings.

(Approx. Hrs: L+P+T = 09)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Select and use the drawing instruments. SO1.2 Write annotations in drawing. SO1.3 Choose appropriate line for a given geometrical entity. SO1.4 Choose appropriate scale factor for the drawing as per given situation. SO1.5 Choose dimensioning style for a given geometrical entity.	LE 1.1 Draw Lettering, types of lines, methods of dimensioning and one problem from Plain scale & Diagonal scale each on a single drawing sheet.	**Unit-1.0 Basics of Engineering Drawing** 1.1 Importance of engineering drawing. 1.2 Drawing instruments: Use of drawing board, mini drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc., sheet layout, title block, folding of drawing sheets. 1.3 Lettering and numbering as per BIS 9609, importance, single stroke letters, slanting letters, upper case and lower case letters, general procedure for lettering and numbering, height of letters. 1.4 Lines- Different types of lines. Scales - full scale, reduced scale and enlarged scale. 1.5 Dimensioning – terms and notations as per BIS, requirement of dimensioning - Dimension line,	• Different type of drawing and instruments

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
		Extension lines and Leader lines, Dimensioning systems, Methods of dimensioning, important dimensioning rules.	

SW-1 Suggested Sessional Work (SW):

- **Assignments:**
  i. Draw triangles, without using a protractor, having base angles of 75^{o} and 15^{o} & 105^{o} and 45^{o} on a 75 mm long line as base.
  ii. Prepare a neat sketch of 'title block' giving all details in a given drawing sheet.
  iii. Write freehand with single stroke, vertical capital letters of 3mm height.
  iv. Sketch the difference between progressive and parallel dimensioning.
  v. Draw a simple scale for a given set of data.

- **Mini Project:**
  i. Collect production and construction drawings from nearby industries/shop and builders respectively and prepare a list of types of letters, scales and dimensioning used.

CO-2 Draw various conic curves.

(Approx. Hrs: L+P+T = 11)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Draw an ellipse for a given set of data. SO2.2 Draw a parabola for a given set of data. SO2.3 Draw a hyperbola for a given set of data. SO2.4 Identify various Conic curves used in different components.	LE 2.1 Draw Parabola, Ellipse and Hyperbola by general and Special methods on a drawing sheet.	**Unit-2.0 Constructions of conic curves** 2.1 Conic Sections- Definition of locus, focus, directrix, axis, Vertex and eccentricity. Definition: ellipse, parabola and hyperbola. 2.2 Ellipse: Construction of ellipse by concentric circle method, Oblong method, Arc of circle method and Eccentricity method or General Method when focus and directrix are given. 2.3 Parabola: Construction of parabola by rectangle method, parallelogram method Tangent method and eccentricity method or General Method when focus and directrix are given. 2.4 Hyperbola: Construction of hyperbola by rectangular method and eccentricity method when focus and directrix are given.	• Involutes of a circle • Cycloid

SW-2 Suggested Sessional Work (SW) :

- **Assignments:**
  i. Draw an ellipse for a given set of data and write its equation also.
  ii. Draw a parabola for a given set of data.
  iii. Draw a hyperbola for a given set of data.

- **Mini Project:**
  i. Explore the applications of engineering curves in different fields of engineering and prepare a short report.

- **Other Activities (Specify):**
  i. Collect production and construction drawings from nearby industries/shop and builders respectively and prepare a list of types of conic curves used.
  ii. Prepare a list of industrial and household components in which conic curves are used and justify the utility of these curves.
  iii. Observe the effect of changing eccentricity in case of parabola and hyperbola.
  iv. Write the equations for parabola in different quadrants.
  v. Through experimentation, justify that the eccentricity of an ellipse is 1.

CO-3 Draw the projection of points, lines and planes with different conditions.

(Approx. Hrs: L+P+T = 14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Draw the projection of points for a given set of conditions. SO3.2 Draw the projection of line for a given set of conditions. SO3.3 Draw the projection of planes for a given set of conditions.	LE 3.1 Draw the problems on projection of points and lines on a drawing sheet. LE 3.2 Draw the projection of given Planes on a drawing sheet	**Unit-3.0 Projections of points, lines and planes** 3.1 Projection of points: Concept of quadrant, first angle and third angle projection. Projection of points – points on different quadrants and on the reference planes. 3.2 Projection of straight lines: Projection of straight lines – Line in the first quadrant and on the reference Planes, perpendicular to one plane and parallel to other plane, inclined to one plane and parallel to the other plane, parallel to both the planes and inclined to both the planes. 3.3 Projection of Planes:	• Projections on auxiliary planes

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
		Concept of planes, a) Projection of planes parallel to one of the reference plane. b) Projection of plane inclined to one reference plane and perpendicular to another. c) Projection of plane inclined to both the reference planes. Note: Triangle, Square / rectangle and circle shape should be included in Various plane problems.	

SW-3 Suggested Sessional Work (SW) :

a. Assignments:

i. Draw the projection of points for a given set of conditions.
ii. Draw the projection of lines for a given set of conditions.
iii. Draw the projection of planes for a given set of conditions.

b. Mini Project:

i. Cut triangular, square, rectangular and circular shaped cardbord/thermocole pieces and observe them by placing in different positions as specified in 3.3.
ii. Cut a cardbord/thermocole cone with various section planes to get circle, ellipse, parabola and hyperbola.

c. Other Activities (Specify):

i. Collect production and construction drawings from nearby industries/shop and builders respectively and observe projection of various shaped planes.

CO-4 Interpret and draw the orthographic and sectional views of an object.

(Approx. Hrs: L+P+T = **16**)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Draw Orthographic views of a given object. SO4.2 Draw Sectional views of a given object.	LE 4.1 Draw the Orthographic projections of a given object with and without section on a drawing sheet. LE 4.2 Draw the projections of a solids and section of given solids on a drawing sheet.	**Unit-4.0. Orthographic projection and Section of solids** 4.1 Introduction, First angle projection, Third angle projection, Symbols and comparison of first and third angle projections. 4.2 Projection of simple objects – front view/ top view/ right/ left side view. 4.3 Concept of sectioning planes, Auxiliary planes, types of sections and true shape of section. 4.4 Projections of Solids: Types of solids, projections of solids in simple position, projections of solids with axes inclined to one of the reference planes and parallel to the other, projections of solids with axes inclined to both H.P. and the V.P. 4.5 Section of solids, Practice problems for drawing projections and section of solids.	• View video programmes related to orthographic projection.

SW-4 Suggested Sessional Work (SW) :

a. Assignments:
i. Draw minimum three drawing sheets on orthographic views of simple machine parts.
ii. Draw minimum three drawing sheets on sectional views of objects.

b. Mini Project
i. Visit your institute's workshop and draw top, front and side views of single point cutting tool.
ii. Take a medium sized hexagonal nut and draw its top and front view.

c. Other Activities (Specify):
i. Collect production and construction drawings from nearby industries/shop and builders respectively and observe the type of orthographic projection, symbol of projection and various views used.

CO-5 Develop isometric view from orthographic views of objects.

(Approx. Hrs: L+P+T) = 12)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 SO5.1 Draw Isometric view from orthographic views of given objects	LE 5.1 Draw isometric views of simple machine elements	**Unit-5.0 Isometric Projection** 5.1 Isometric axis, lines, and planes, isometric scale, isometric projection, isometric drawing. 5.2 Isometric projection of objects containing rectangular, circular, cylindrical shapes and slots on sloping and plane Surfaces.	• View video programmes related to this outcome.

SW-5 Suggested Sessional Work (SW):

a. Assignments:

i. Draw minimum three sheets on isometric views.

b. Mini Project:

i. Take a medium sized hexagonal nut and draw its isometric projection

c. Other Activities (Specify):

i. Collect production and construction drawings/photographs in which isometric, oblique and perspective projections are used.

CO-6 Use Computer aided Drafting software like AutoCAD to draw 2D geometric entities.

(Approx. Hrs: L+P+T = 18)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO6.1 Use computer aided drafting software like AutoCAD **for** creating simple drawings.	LE 6.1 Draw minimum two drawings using AutoCAD software.	**Unit-6.0 Computer aided Drafting** 6.1 Basics of AutoCAD AutoCAD interface, screen layout, starting commands from menus, Coordinate system, Angular measurements, Point specification, Drawing aids - Grid, Snap, Ortho, Osnap, Units, Limits, Layers, Linetype. 6.2 Creating basic drawings Drawing objects - lines, arc, circles, ellipses, polyline and polygons. 6.3 Modify commands - erase, copy, move, rotate, scale, stretch, array. 6.4 Printing and plotting of drawings.	• View video programmes related to Auto Cad to draw 2D geometric entities.

SW-6 Suggested Sessional Work (SW):

a. Assignments:

i. Draw minimum five drawings using AutoCAD software.

b. Mini Project:

i. Prepare an A4 template of your institute with title block and institute logo.

ii. Prepare a spur gear of 20^{o} pressure angle using array command.

c. Other Activities (Specify):

i. Collect atleast two AutoCAD tutorial videos from web and submit them to your teacher.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

I) Suggested Specification Table (For ESE of Classroom Instruction):

Unit Number	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
I	Basics of Engineering Drawing	2	2	6	10
II	Constructions of conics	2	2	6	10
III	Projections of point, line and planes	-	-	12	12
IV	Orthographic Projection and Section of solids	2	2	10	14
V	Isometric Projection	2	-	10	12
VI	Computer aided Drafting	2	-	10	12
Total		**10**	**6**	**54**	**70**

Legend: R: Remember, U: Understand, A: Apply and above

J) Suggested Specification Table (For ESE of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Titles	Assessment of Laboratory Work (Marks)			Marks are allocated for performance under ESE based on following performance parameters:
		Performance		Viva-Voce	
		PRA	PDA		
LE1.1	Draw Lettering, types of lines, methods of dimensioning and one problem from Plain scale & Diagonal scale each on a single drawing sheet.	15	10	5	• Submission of drawings as per schedule • Neatness, Cleanliness on all prepared drawing sheets • Uniformity in drawing and line work • Dimensioning the given drawing and writing text • Visualization and drawing ability
LE2.1	Draw Parabola, Ellipse and Hyperbola by general and Special methods on a drawing sheet.	15	10	5	
LE3.1	Draw the problems on projection of points and lines on a drawing sheet.	15	10	5	
LE3.2	Draw the projection of given Planes on a drawing sheet.	15	10	5	
LE4.1	Draw the Orthographic projections of a given object with and without section on a drawing sheet.	15	10	5	
LE4.2	Draw the projections of a solids and section of given solids on a drawing sheet.	15	10	5	
LE5.1	Draw isometric views of simple machine elements.	15	10	5	
LE6.1	Draw minimum two drawings using AutoCAD software.	15	10	5	

*Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practicals ,

Legend: PRA: Process Assessment, PDA : Product Assessment

Note: Only one experiment has to be performed at the end semester examination of **30 Marks** as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Industrial visits
4. Industrial Training
5. Field Trips
6. Portfolio Based Learning
7. Demonstration
8. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile)

L) Suggested Learning Resources:

(a) Books :

S. No.	Titles	Author	Publisher and Edition*
1	Engineering Drawing	N.D. Bhatt	Charotar Publisher
2	Engineering Drawing	R.B. Gupta	Satya Prakashan
3	Engineering Drawing	Gujral & Shende	Khanna Publisher
4	Engineering Drawing	R.K.Dhawan	S.Chand
5	Engineering Drawing	P.J.Shah	S.Chand
6	Engineering Drawing	M.B.Shah, B.C.Rana	Pearsons
7	Engineering Graphics with AutoCAD	A.K.Sarkar, A.P.Rastogi, D.M. Kulkarni	PHI
8	Engineering Drawing and Graphics using AutoCAD	T. Jeyapoovan	Vikas

*Latest edition of all above books should be referred

(b) Open source software and website address:

1. Introduction: https://www.youtube.com/watch?v=z4xZmBpXIzQ
2. dimensioning system : https://www.youtube.com/watch?v=OF3S6BjMKsI
3. Basic of engineering drawing : https://www.youtube.com/watch?v=FEju-hA5Peo
4. Engineering scales : https://www.youtube.com/watch?v=n9iQcttWHAo
5. Engineering curves : https://www.youtube.com/watch?v=8sZkhL64-Qw&list=PLeFT-Ztj-s49OnKf3zO10MhVBH16GvZLn
6. Conic section : https://www.youtube.com/watch?v=1AMyZ-WzPB0
7. 1st and 3rd angle projection : https://www.youtube.com/watch?v=mcxUTNkSyp4
8. Orthographic projection : https://www.youtube.com/watch?v=nDmwL1IWoIc
9. Projection of point : https://www.youtube.com/watch?v=Wy10RORC0s8
10. Projection of line : https://www.youtube.com/watch?v=UewSQ061MzM
11. Projection of plane : https://www.youtube.com/watch?v=KWuW5VZf9a0
12. Basic of isometric projection : https://www.youtube.com/watch?v=p7Tz17Af-zE
13. Isometric projection : https://www.youtube.com/watch?v=k2frX4CXJ_Y

14. Auto cad : https://www.youtube.com/results?search_query=autocad+for+ beginners+in+hindi+
15. Auto cad : https://www.youtube.com/watch?v=ohjh0JjQHnY
16. Auto cad : https://www.youtube.com/watch?v=ZugYdLxsg0E
17. Nptel Web reference : http://nptel.ac.in/courses/112103019/15

(c) Others:

1. Learning Packages.
2. Manufacturers' Manual

M) List of Major Classroom Instruction Aid Equipments and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Computer aided drafting software like AutoCAD	Latest educational licensed network version	LE6.1
2	CAD workstations	latest configuration	LE6.1
3	Drawing boards	A1 size	LE1.1, LE2.1, LE3.1, LE3.2, LE4.1, LE4.2, LE5.1
4	Interactive board (165 x 130 cm)	Supports dual touch, dual write and intuitive gestures, such as toss, rotate and zoom, available with multitouch operating systems, such as Windows®	All
5	Printer/plotter	A3 size	LE6.1
6	Models for projection and demonstration	Wooden models	LE2.1, LE3.1, LE3.2, LE4.1, LE4.2, LE5.1

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)		
	PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2	PSO-3
CO-1 Use drawing instruments, scales, and standard norms to create drawings.	3	3	2	3	1	1	1	1	1	3	-	-	-
CO-2 Draw various conic curves.	3	2	3	2	1	1	2	1	2	3	-	-	-
CO-3 Draw the projection of points, lines and planes with different conditions.	2	2	2	2	1	1	1	1	3	3	-	-	--
CO-4 Interpret and draw the orthographic & sectional views of an object.	2	3	2	2	1	1	1	1	3	3	-	-	-
CO-5 Develop isometric view from orthographic views of objects.	3	3	3	2	1	1	2	1	3	3	-	-	-
CO-6 Use computer aided drafting software like AutoCAD to draw 2D geometric entities.	3	3	3	2	1	1	2	1	3	3	3	-	-

Legend: 1 – Low, 2 – Medium, 3 – High

O) Course Curriculum Map:

POs & PSOs No.	COs No. & Titles	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO-1,2,3,4,5,6, 7,8,9,10	CO-1 Use drawing instruments, scales, and standard norms to create drawings.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LE1.1	Unit-1.0 Basics of Engineering Drawing 1.1, 1.2, 1.3, 1.4, 1.5	As mentioned in relevant pages
PO-1,2,3,4,5,6, 7,8,9,10	CO-2 Draw various conic curves.	SO2.1 SO2.2 SO2.3 SO2.4	LE2.1	Unit-2.0 Construction of Conics 2.1, 2.2 ,2.3	
PO-1,2,3,4,5,6, 7,8,9,10	CO-3 Draw the projection of points, lines and planes with different conditions.	SO.3.1 SO3.2 SO3.3	LE3.1, LE3.2	Unit-3.0 Projection of points, lines and planes 3.1, 3.2, 3.3	
PO-1,2,3,4,5,6, 7,8,9,10	CO-4 Interpret and draw the orthographic and sectional views of an object	SO4.1 SO4.2 SO4.3	LE4.1, LE4.2	Unit-4.0 Orthographic projection and Section of solids 4.1, 4.2	
PO-1,2,3,4,5,6, 7,8,9,10	CO-5 Develop isometric view from orthographic views of objects.	SO5.1 SO5.2	LE5.1	Unit-5.0 Isometric Projection 5.1, 5.2	
PO-1,2,3,4,5,6, 7,8,9,10	CO-6 Use computer aided drafting software like AutoCAD to draw 2D geometric entities.	SO6.1 SO6.2 SO6.3 SO6.4	LE6.1	Unit-6.0 Computer aided Drafting	

A) Course Code : 2000276(037)

B) Course Title : Workshop Practice

C) Pre- requisite Course Code and Title :

D) Rationale :

Mechanical Workshop practice is an essential requirement to understand the working and execution of jobs in industrial environment. This course intends to impart basic know-how of various tools, methods and their use at different stages of manufacturing. This course will develop skills in handling tools, instruments, equipments used in the workshop and perform operations in various shops and enhance relevant technical skills required to work in an industry along with the understanding of the complexity of the industrial job.

E) Course Outcomes:

CO-1 Use measuring devices and hand tools effectively.

CO-2 Undertake wood working operations economically and safely.

CO-3 Perform various joining operations using welding, brazing and soldering methods.

CO-4 Perform different types of fitting and sheet metal operations.

CO-5 Prepare simple jobs using lathe.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Mechanical Engineering	2000276(037)	Workshop Practice	1	-	-	1
2	Mechanical Engineering	2000294(037)	Workshop Practice (Practical)	-	4	-	2

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), T- Tutorial includes Sessional Work (SW) (assignment, seminar, mini project etc.) and Self Learning(SL), C:Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning

F) Scheme of Assessments:

S.No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1.	Mechanical Engineering	2000276(037)	Workshop Practice	-	-	30	-	-	30
2.	Mechanical Engineering	2000294(037)	Workshop Practice (Lab)	-	-	-	50	30	80

Legend: ESE: End Semester Exam, CT: Class Test, TA: Teacher Assessment

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T- Tutorial Includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO- 1 Use measuring devices and hand tools effectively.

(Approx. Hrs: L+P+T = 14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 List various measuring tools and instrument. SO1.2 Describe measuring unit and its conversion. SO1.3 Select suitable measuring devices in a given situation. SO1.4 List workshop hand tools. SO1.5 Describe Safety procedure in different workshops.	LE1.1 Identify different type of measuring tools available in workshop. LE1.2 Use suitable Marking and hand tools in a given situation. LE1.3 Measure the given job using suitable measuring Devices. LE1.4 Perform mock drill session in group of minimum 15 students for extinguishing fire.	**Unit- 1.0 Measurement, Hand tools and workshop safety.** 1.1 Engineering Measurement: definition, importance and Types of measurements. 1.2 Measuring instruments: linear measurement and angular measurement instruments. 1.3 Measuring devices: Linear measurement and angular measurement devices. 1.4 Workshop hand tools: List the various hand tools used in workshops. 1.5 Workshop Safety –Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols. Firefighting equipment, fire extinguishers, and their types and First Aid	• Collect the information related to various hand tools listed.

SW-1 Suggested Sessional Work (SW):

Assignments:

i. Select any engineering object / part / drawing and perform the measurement using suitable measuring device.

Mini Project:

i. Visit nearby mechanical workshop and collect information about operation peformed by identified workshop and prepare the list of tools and equipment alongwith specification.

CO-2 Undertake wood working operations economically and safely.

(Approx. Hrs: L+P+T = 17)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 List various wood working tools with major specifications. SO2.2 Select wood working tools as per given job. SO2.3 Demonstrate various wood working operations. SO2.4 Explain procedure to prepare given type of joint.	LE2.1 Prepare one simple job of wood working comprises of marking, cutting, plaining and finishing as per given drawing/sketch. LE2.2 Prepare any two wooden joints safely as per given drawing.	**Unit- 2.0 Wood Working Shop** 2.1 Types of woods and artificial woods and their applications. 2.2 wood working tools –bench vice, hammers, chisel, files, hacksaw, wood saw, surface planer, punch, v block, try square , steel rule , twist drill, marking block, reamers, tap set, mallet and their specification. 2.3 Wood working operations – Marking ,Cutting , reaming , filing, drilling, joining, 2.4 Types of wood working joint – Butt joint , lap joint, Bridle joint , Dowel joint, Mitre joint , finger joint , dovetail joint , Dado joint, Groove joint, Cross lap, splice joint. 2.5 Applications of various joints.	• Collect the information on various types and appearance of wood being used in packaging of industrial products using internet facility.

SW-2 Suggested Sessional Work (SW):

- **Assignments:**
  i. Select any (Minimum 3 finished jobs) different wood working / carpentry jobs and prepare list of different types of woods and joints used in selected objects.

- **Mini Project:**
  i. Make a wooden job as per given drawing and specifications of material.

CO-3 Perform various joining operations using welding, brazing and soldering methods.

(Approx. Hrs: L+P+T = 17)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Perform various types of joining methods. SO3.2 Select suitable welding method as per job requirement. SO3.3 Explain arc welding and gas welding procedure.	LE3.1 Operate gas welding apparatus to generate different types of flames. LE3.2 Prepare lap joint using gas welding as per given drawing safely. LE3.3 Prepare butt joint using arc welding as per given drawing safely. LE3.4 Mount the given electronic component on Printed circuit board (PCB) in a given situation. LE3.5 Join the given aluminum sheet by using brazing.	**Unit- 3.0 Joining Methods :** 3.1 Joining methods- Various types of Joining Methods and their field application and types of welding joint. 3.2 Arc welding 3.2.1 Arc welding process, equipment with necessary accessories, Welding electrode, tools and consumables 3.3 Personal protective equipment like safety glasses, welding gloves etc and safe practices in welding shop. 3.4 Gas welding 3.4.1 Gas welding process, Equipment with necessary accessories, Types like Carburizing, oxidizing and neutral flame. 3.5 Soldering and brazing: specification, filler material, flux, heating methods, temperature range, advantages, and comparison.	• Collect the information on various types of welding electrodes and their industrial applications.

SW-3 Suggested Sessional Work (SW):

- **Assignments:**
  i. Select any two joining method and prepare their engineering field of application.

- **Mini Project:**
  i. Prepare any utility job like lab stool structure by using suitable welding process with list of tools and equipment along with specification.

CO-4 Perform different type of fitting and sheet metal operation.

(Approx. Hrs: L+P+T = 18)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Identify various tools used in fitting shop. SO4.2 Select relevant tools as per given job in fitting shop. SO4.3 Perform various fitting operations. SO4.4 Peform various sheet metal operations.	LE4.1 Prepare one simpleJob of fitting shop as per given drawing and instruction. LE4.2 Prepare one male – female type Fitting Jobs as per given Drawing. LE4.3 Prepare one sheet metal job using cutting, bending, edging and joining operations as per given drawing.	**Unit- 4.0 Fitting and Sheet metal Shop.** 4.1 Fitting tools – Hand tools used in fitting shop, holding tools, Marking and measuring tools, cutting tools. 4.2 Fitting Operation –Sawing, Chipping, Filling, Taping, Reaming and Drilling. 4.3 Sheet metal tools-listof sheet metal tools used. 4.4 Sheet metal operation-Shearing, Bending, Drawing, Squeezing, Snipping, riveting, Grooving.	• Using internet facility and collect the information related to field applications of sheet metal.

SW-4 Suggested Sessional Work (SW):

- **Assignments:**
  i. Prepare simple jobs as per drawing and instructions given.

- **Mini Project:**
  i. Prepare file stand by using by suitable material and sheet metal operations.

CO-5 Prepare simple jobs using lathe

(Approx. Hrs: L+P+T = 14)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 Explain working principle of lathe machine. SO5.2 Explain various components of lathe machine. SO5.3 Describe job and tool holding devices. SO5.4 Calculate speed, feed, depth of cut f lathe machine SO5.5 Perform simple lathe operations.	LE5.1 Prepare one simple turning job as pergiven drawing. LE5.2 Perform drilling/ knurling/threading operation toprepare job as per given drawing.	**Unit- 5.0 Lathe Machine** 5.1 Concept, Working principle, constructional details and major components of lathe machine with their functions. 5.2 Job and tool holding devices and lathe attachments – head stock , tail stock, tool post, Lathe tools, chucks (3 and 4 Jaw), name and advantages of lathe attachment. 5.3 Lathe operations – Plain turning, Facing, taper turning , Knurling, Threading etc.	• Collect data on various applications of lathe machine for engineering applications.

SW-5 Suggested Sessional Work (SW):

- **Assignments:**
  i. Visit the institute workshop and prepare a report comprises of names of different machine tools / tools their specifications and manufacturer's name.

- **Mini Project:**
  i. Visit the nearby workshop /machine shop and prepare the field report comprises of the following
     a. Product(s) name
     b. List of machine tools with associated accessories,
     c. List of lathe tools with relevant accessories
     d. List major clients.

Note: Performance under Laboratory and Sessional work may appear in more than one COs/SOs.

J) Suggested Specification Table (For ESE of Laboratory Instruction*):

Laboratory Instruction Number	Short Laboratory Experiment Titles	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE1.1	Measuring tools available in workshop.	30	15	5
LE1.2	Marking and hand tools in a given situation.	30	15	5
LE1.3	Mock drill session for extinguishing fire	35	10	5
LE2.1	Preparation of simple wooden job.	25	20	5
LE2.2	Preparation of two wooden joints	25	20	5
LE3.1	Operate gas welding apparatus	30	15	5
LE3.2	Preparation of lap joint using gas welding	25	20	5
LE3.3	Preparation of butt joint using arc welding	25	20	5
LE3.4	Mounting of electronic components on PCB	30	15	5
LE3.5	Joining of aluminum sheet by using brazing.	25	20	5
LE4.1	Preparation of simple fitting job.	25	20	5
LE4.2	Preparation of simple male –female type fitting job.	25	20	5
LE4.3	Preparation of sheet metal job .	25	20	5
LE5.1	Preparation of simple turning job.	25	20	5
LE5.2	Preparation of simple drilling/ knurling /threading using lathe	25	20	5

*Assessment rubric, process and product check list with rating scale need to be prepared by the course wise teachers for each experiment for conduction and assessment of laboratory experiments /practical's

Legend: PRA: Process Assessment, PDA: Product Assessment

Note: Only one experiment has to be performed at the end semester examination of **50 Marks** as per assessment scheme

K) Suggested Instructional/Implementation Strategies:

1. Improved Lecture Method
2. Industrial visits
3. Expert Lecture
4. Field Trips
5. Self Learning
6. Portfolio Based Learning
7. Observation, Practice and Feedback
8. Classroom, Laboratory, Workshop, Field, Video, Live Demonstrations
9. Real Model
10. Charts
11. Demonstration
12. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile) can be integrated with many method

L) Suggested Learning Resources:

(a) Books :

S. No.	Titles	Author	Publisher	Edition & Year
1	Workshop Practice	Bawa, H.S.	McGraw Hill Education, Noida; ISBN: 978-0070671195	Latest
2	A Textbook of Manufacturing Process (Workshop Tech.)	Gupta, J.K.; Khurmi, R.S.	S.Chand and Co. New Delhi ISBN:81-219-3092-8	Latest
3	Introduction to Basic Manufacturing Process & Workshop Technology	Singh, Rajender	New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7	Latest
4	Elements of Workshop Technology	Hajra; Choudhary;	Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146	Latest

(b) List of open source software/learning website :

1. Measuring device : https://www.youtube.com/watch?v=3M4rsWBYaIA
2. Precision measuring device : https://www.youtube.com/watch?v=JX8gHdNpamk
3. Angular measuring device : https://www.youtube.com/watch?v=dgkLbX4cqr4
4. Workshop hand tools: https://www.youtube.com/watch?v=4o0tqF0jDdo
5. Wood working joint : https://www.youtube.com/watch?v=UDQ_aS8qvaU
6. Wood working tools : https://www.youtube.com/watch?v=aCe9dNzCVQU
7. Joining method : https://www.youtube.com/watch?v=rFKtP_6w4B0
8. Arc welding: https://www.youtube.com/watch?v=ZQ7vdwjmX80
9. Gas welding process: https://www.youtube.com/results?search_query=gas+welding+process+animation
10. Types of flame: https://www.youtube.com/watch?v=1OLppHw6GRE
11. Types of welding process: https://www.youtube.com/watch?v=CCzhT81GrBo
12. Soldering and brazing : https://www.youtube.com/watch?v=BplzRtQAMw0
13. Welding safety equipment : https://www.youtube.com/watch?v=S1H_mV3Webo
14. Fitting shop : https://www.youtube.com/watch?v=dVxjT5kkhFc
15. Sheet metal operation : https://www.youtube.com/watch?v=95rgHM58dgw
16. Drilling operation : https://www.youtube.com/watch?v=zf9rgvzjkpY
17. Shearing operation : https://www.youtube.com/watch?v=VMu7_W0QE3Y
18. Drawing operation : https://www.youtube.com/watch?v=MQwHMebFuZM
19. Lathe component: https://www.youtube.com/watch?v=YQznrRi3heQ
20. Lathe Machine operation : https://www.youtube.com/watch?v=OgqsjZJwce8
21. Work holding devices : https://www.youtube.com/watch?v=jP1-IzLtXRw
22. Working principle of lathe : https://www.youtube.com/watch?v=NgbbB1tdmo4

(c) Others:

1. Learning Packages.
2. Lab Manuals.
3. Manufacturers' operating Manual

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1.	Measuring Instruments	Vernier calliper, Micrometer outside & inside, Bevel protractor, Pair of Inside spring calliper 150 mm, Pair of outside spring calliper- 250 mm	LE1.1 & 1.2
2.	Vernier height Gauge	Vernier height Gauge 450 mm	LE1.1 & 1.2
3.	Surface Plate	Surface Plate 600 x 900 mm Grade I	LE1.1 & 1.2
4.	Angle Plate	Angle Plate 450 x 450 mm	LE1.1 & 1.2
5.	Fire Safety Equipment	Fire buckets of standard size.	LE1.3
6.	Fire Safety Equipment	Fire extinguisher A,B and C types	LE1.3
7.	Wood Turning Lathe	Wood Turning Lathe Machine, Height of Centre: 200mm, Distance between Centers: 1200mm, Spindle Bore: 20mm with Taper, Range of Speeds: 425 to 2800 with suitable Motor Drive. with all accessories	LE2.1 & 2.2
8.	Circular Saw Machine	Circular Saw Machine, Diameter of saw blade 200 mm, Maximum Depth of Cut 50 mm, Table Size - 350 x 450 mm, Table Tilting - 450	LE2.1 & 2.2
9.	Wood working tools	Wood working tools- marking and measuring tools, saws, claw hammer, mallet, chisels, plans, squares,	LE2.1 & 2.2
10.	Carpentry Vice	Carpentry Vice 200 mm	LE2.1 & 2.2
11.	Work Benches	Work Benches- size:1800 x 900 x 750 mm	LE4.1 & 4.2
12.	Drilling machine	Bench Drilling machine (up to 13 mm drill cap.) with ½ H.P. Motor 1000 mm. Height.	LE4.1 & 4.2
13.	Power Saw machine	Power Saw machine 350 mm mechanical with 1 HP Motor & all Accessories.	LE4.1 & 4.2
14.	Bench Grinder	Bench Grinder 200 mm Grinding Disc diameter 200 mm. with 25 mm. bore 32 mm. with ½ HP/1HP Motor.	LE4.1 & 4.2
15.	Arc Welding machine	Welding machine 20 KVA 400A welding current 300A at 50, 100, 200, 250, 300 with std. Accessories and Welding Cable 400 amp. ISI with holder	LE3.3

16.		Arc welding hand tools- electrode holder, cable connector, cable lugs, chipping hammer, earthling clamp, wire brush.	LE3.3
17.	PPE	Personal Protective Equipment like safety gloves, face shield /screen, safety goggle, apron safety shoes and helmet etc.	LE3.3
18.	Gas welding apparatus	Oxygen and acetylene gas welding and cutting kit with cylinders and regulators.	LE3.2
19.		Gas welding hand tools- welding torch, welding tip, pressure regulator, oxygen and acetylene cylinders, spark lighter	LE3.1 & 3.2
20.	Pipe Bending Machine	Pipe Bending Machine	For MiniProjects
21.	Pipe Vice	Pipe Vice – 100 mm	
22.	Pipe Cutter	Pipe Cutter- 50 mm	
23.	Bench Vice	Bench Vice 100 mm	
24.	Portable drill Machine	Portable Hammer Drill Machine 0-13 mm A.C. 230 V, 2.5Amp, Pistol type, having different types of bits	
25.	Sheet Bending Machine	Sheet Bending Machine	LE4.3
26.	Sheet Cutting Machine	Sheet Cutting Machine	LE4.3
27.	Brazing Equipment	Brazing Equipment	LE3.5
28.	Soldering Iron	Soldering iron, Flux for soldering and Solder filler material.	LE3.4
29.	PCB	Various types of electronic components and Printed Circuit Boards (PCB)	LE3.4
30.	Fitting tools	Fitting tools - hammers, chisels, files (smooth & rough file, round, flat, safe edge, square, knife edge, triangular, half round file) hacksaw, surface plate, punch, v block, angle plate, try square, marking block, steel rule, twist drills, reamers, tap set, die set.	LE4.1 & 4.2
31.	Plumbing tools	Plumbing tools- pipe vice, pipe bending equipment, pipe wrenches, dies.	For Mini Projects
32.	Sheet metal hand tools	Sheet metal hand tools- snip, shears sheet gauge, straight edge, L square, scriber, divider, trammel, punches, pliers, stakes, grooves, limit set	LE4.3

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)		
	PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Experiments and practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2	PSO-3
CO-1 Use measuring devices and hand tools effectively.	2	2	3	3	1	1	1	2	1	1	-	2	2
CO-2 Undertake wood working operations economically and safely.	2	2	3	3	1	1	1	2	1	1	-	2	2
CO-3 Perform various joining operations using welding, brazing and soldering methods	2	2	3	3	1	1	1	2	1	1	-	2	2
CO-4 Perform different types of fitting and sheet metal Operations	2	2	3	3	1	1	1	2	1	1	-	2	2
CO-5 Prepare simple jobs using lathe	2	2	3	3	1	1	1	2	1	1	-	2	2

Legend: 1 – Low, 2 – Medium, 3 – High

O) Course Curriculum Implementation Map:

POs & PSOs No.	COs No. & Titles	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO 1,2,3,4,5,6, 7,8,9,10 PSO 2,3	CO-1 Use measuring devices and hand tools effectively.	SO-1.1, 1.2, 1.3, 1.4	LE1.1, 1.2, 1.3	Unit-1.0 Measurement, Hand tools and Workshop Safety. 1.1, 1.2, 1.3, 1.4	As mentioned in relevant pages
PO 1,2,3,4,5,6, 7,8,9,10 PSO 2,3	CO-2 Undertake wood working operations economically and safely.	SO-2.1, 2.2, 2.3, 2.4	LE2.1 ,2.2	Unit-2.0 Wood Working Shop. 2.1, 2.2, 2.3	
PO 1,2,3,4,5,6, 7,8,9,10 PSO 2,3	CO-3 Perform various joining operations using welding, brazing and soldering methods	SO-3.1, 3.2, 3.3	LE3.1, 3.2, 3.3, 3.4	Unit-3.0 Joining Methods 3.1, 3.2, 3.3, 3.4	
PO 1,2,3,4,5,6, 7,8,9,10 PSO 2,3	CO-4 Perform different types of fitting and sheet metal operations	SO-4.1, 4.2, 4.3, 4.4	LE4.1, 4.2,4.3	Unit-4.0 Fitting and Sheet Metal Shop 4.1, 4.2, 4.3, 4.4	
PO 1,2,3,4,5,6, 7,8,9,10 PSO 2,3	CO-5 Prepare simple jobs using lathe	SO-5.1, 5.2, 5.3, 5.4	LE5.1, 5.2	Unit-5.0 Lathe Machine 5.1, 5.2, 5.3	

A) Course Code : 2000293(046)

B) Course Title : Seminar & Technical Presentation (Listening, Reading & Speaking) Skills

C) Pre- requisite Course Code and Title :

D) Rationale :

Technical Writing and Presentation Skills are core skills to be developed in diploma graduates as students exchange information and convey their ideas and opinions with different stakeholders. Students in technical institutes need to be trained for this. The present curriculum focuses on the attainment of course outcomes related to soft skills, so that the students are confident, self-reliant and capable of presenting themselves appropriately.

E) Course Outcomes :

CO-1 Demonstrate effective listening and reading skills with clarity.

CO-2 Demonstrate appropriate presentation skills using different aids and techniques.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits(C) L+T+(P/2)
1	Humanities	2000293 (046)	Seminar & Technical Presentation(Listening, Reading & Speaking) Skills	-	2	-	1

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), T- Tutorial includes Sessional Work (SW) (assignment, seminar, mini project etc.) and Self Learning(SL), C:Credits

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning

G) Scheme of Assessment:

S.No	Board of Study	Course Code	Course Title	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Humanities	2000293 (046)	Seminar & Technical Presentation(Listening, Reading & Speaking) Skills	-	-	-	-	50	50

Legend: ESE: End Semester Exam, CT: Class Test, TA: Teacher Assessment

H) Course-Curriculum Detailing:

This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T-Tutorial Includes Sessional Work (SW) and Self Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

CO-1 Demonstrate effective listening and reading skills with clarity

(Approx. Hrs: L+P+T=16)

Session Outcomes (SOs)	Laboratory Instruction/Classroom Instruction (P/L)	Self Learning (SL)
SO1- Communicate effectively using correct pronunciation, modulation, pitch etc.	1.1 Need of Learning to learn skills (Listening, Reading and Speaking) 1.2 Methods of good study habits 1.3 Practice Loud reading 1.4 Practice Active Listening 1.5 Practice Speaking in Class(Group Discussion, Extempore, Debate, Role Play etc.,	• One Word Substitution • Rearrangement of Jumbled words • Use Synonyms and Antonyms appropriately. • Reading Current articles from newspaper magazines

CO-2 Demonstrate appropriate Presentation Skills using different aids and techniques.

(Approx. Hrs: L+P+T=16)

Session Outcomes (SOs)	Laboratory Instruction/Classroom Instruction (P/L)	Self Learning (SL)
SO-2 Display Different Presentation Skills by using different techniques	2.1 Characteristics of good oral Presentation 2.2 Ways of oral presentation 2.3 Gestures Mannerism during oral Presentation 2.4 Preparing Successful Presentations 2.5 Making Effective Use of Visual Aids	• Short Stories • Magazines • Articles etc.

SW- Suggested Sessional Work (SW):

a. Assignments:

Loud reading of given stories by each student in the class.
Similar activity can be done with the help of News papers/Magazines.

b. Mini Project:

Recorded Lectures may be played in the class and students are asked to listen and answer.

c. Other Activities (Specify):

Self-Introduction, Speech and Spell Test.

Note: There will be no end semester examination for laboratory as well as classroom instructions and practical activity will be assessed for term work.

I) Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Case Method
4. Group Discussion
5. Role Play
6. Demonstration
7. ICT Based Teaching Learning (Video Demonstration/Tutorials CBT, Blog, Facebook, Twitter, WhatsApp, Mobile, Online sources)
8. Brainstorming

J) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	English Grammar in Use	Murphy Raymond	Cambridge Publications	4th Edition
2	Living English Structure	Allen	Cambridge Publications	Fifth edition(2009)
3	Effective English with CD	Kumar, E. Suresh; Sreehari,P.; Savithri, J.	Pearson Education, Noida, New Delhi	2009 *ISBN:* 978-81-317-3100-0
4	English Grammar at Glance	Gnanamurali, M.	S. Chand and Co. New Delhi,	2011 *ISBN*:9788121929042
5	Elementary English Grammar and Composition	Agarwal N.K.	Goyal Brothers Prakashan	Latest Edition

(b) Open source software and website address:

1. https://www.englishgrammar.org/
2. http://www.englishgrammarsecrets.com/
3. https://www.usingenglish.com/handouts/
4. http://learnenglish.britishcouncil.org/en/english-grammar

5. https://www.englishclub.com/grammar/
6. http://www.perfect-english-grammar.com/
7. http://www.englishteachermelanie.com/category/grammar/
8. https://www.grammarly.com/blog/category/handbook
9. https://www.britishcouncil.in/english/learn-online
10. http://learnenglish.britishcouncil.org/en/content
11. http://www.talkenglish.com/
12. languagelabsystem.com
13. www.wordsworthelt.com

(c) Others:

1. Learning Packages.
2. Lab Manuals.
3. Language software Manual
4. Users' Guide

K) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Computers	A complete computer system with headphones & Speakers	All
2	Soft ware	English communication softwares – Globarina, A-One Solutions, Wordsworth, Spears	All
3.	Computer tables & chairs	Depending upon the size of the Language Lab	All

L) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	PO-1 Basic knowledge	PO-2 Discipline knowledge	PO-3 Experiments and practice	PO-4 Engineering Tools	PO-5 The engineer and society	PO-6 Environment and sustainability	PO-7 Ethics	PO-8 Individual and team work	PO-9 Communication	PO-10 Life-long learning	PSO-1	PSO-2
CO-1 Demonstrate effective listening and reading skills with clarity	2	1	1	1	-	-	-	-	2	2	1	1
CO-2 Demonstrate appropriate Presentation Skills using different aids and techniques.	1	1	2	2	-	-	-	-	2	3	1	1

Legend:1 – Low, 2 – Medium, 3 – High

M) Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(P)	Classroom Instruction (L)	Self Learning (SL)
PO1,2,3,4,9,10 PSO 1,2	CO-1 Demonstrate effective listening and reading skills with clarity	SO1	LE1.1 LE1.2 LE1.3 LE1.4 LE 1.5		
PO 1,2,3,4,9,10 PSO 1,2	CO-2 Demonstrate appropriate Presentation Skills using different aids and techniques.	SO2	LE2.1 LE2.2 LE2.3 LE2.4 LE2.5		

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