

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Diploma in Civil/Electrical/EEE/Mining & Mine Surveying (Group-IA)

Semester - II

Scheme of Studies:

S.No	Board of Study	Course Code	Course Titles	Scheme of Studies (Hours/Week)			
				L	P	T	Credit L+(P+T)/2
1	Humanities	200251 (46)	Communication Skills-II	4		1	5
2	Applied Science	200252 (14)	Applied Maths-II	3		1	4
3	Applied Science	200253 (14)	Applied Chemistry	3		1	4
4	Applied Science	200254 (14)	Applied Physics	3		1	4
5	Mechanical Engineering	200255 (37)	Basic Non-Conventional Energy Sources	1		1	2
6	Mechanical Engineering	200256 (37)	Engineering Drawing	2		4	4
7	Applied Science	200261 (14)	Applied Chemistry Lab		3		2
8	Applied Science	200262 (14)	Applied Physics Lab		3		2
9	Mechanical Engineering	200263 (37)	Basic Non-Conventional Energy Sources Lab		3		2
10	Humanities	200264 (46)	Seminar & Technical Presentation Skill Part-II		2		1
Total				16	11	9	30

L - Lecture, T - Tutorial, P - Practical,

Legend:- Lecture (L) --> CI : Classroom Instruction (Includes different instructional strategies i.e. Lecture and others).

Practical (P) --> LI : Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies.

Tutorial (T) --> SL : Self Learning.

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Scheme of Examination:

S.No	Board of Study	Course Code	Course Titles	Scheme of Examination					
				Theory			Practical		Total Marks
				ESE	CT	TA	ESE	TA	
1	Humanities	200251 (46)	Communication Skills-II	100	20	30			150
2	Applied Science	200252 (14)	Applied Maths-II	100	20	30			150
3	Applied Science	200253 (14)	Applied Chemistry	100	20	30			150
4	Applied Science	200254 (14)	Applied Physics	100	20	30			150
5	Mechanical Engineering	200255 (37)	Basic Non-Conventional Energy Sources			30			30
6	Mechanical Engineering	200256 (37)	Engineering Drawing	100	20	30			150
7	Applied Science	200261 (14)	Applied Chemistry Lab				50	20	70
8	Applied Science	200262 (14)	Applied Physics Lab				50	20	70
9	Mechanical Engineering	200263 (37)	Basic Non-Conventional Energy Sources Lab				50	20	70
10	Humanities	200264 (46)	Seminar & Technical Presentation Skill Part-II					10	10
Total				500	100	180	150	70	1000

ESE : End of Semester Exam, CT: Class Test, TA: Teachers Assessment

Legend :- PRA :Process Assessment, PDA : Product Assessment.

Note :- i) TA in Theory includes Sessional work (SW) and Attendance (ATT) with weightage of 70% and 30% of total respectively.

ii) TA in Practical includes performance of PRA, PDA and Viva-Voce with weightage of 50%, 40% and 10% of total respectively.

iii) 85% attendance is essential in theory & Practical classes appear in examination.

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- A) Course Code : 200251 (46)
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 holders 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 Draft letters, notices and circulars using correct formats.

CO-4 Draft different types of report 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 L+(P+T)/2
1.	Humanities	200251 (46)	Communication Skills-II	4	-	1	5

Legend: L-Lecture, P-Practical, T-Tutorial

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	200251 (46)	Communication Skills-II	100	20	30	-	-	150

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

- Note:** i. Separate passing is must for End Semester Assessment.
ii. Separate passing is must for Classroom Assessment (Theory)

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 (CI), Laboratory Instruction (LI), 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.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO1.1 Use infinitives in proper place SO1.2 Make basic sentence pattern SO1.3 Change Narration SO1.4 Use different degree in sentences SO1.5 Correct Use of Adverbial Phrases.	LE1.1 Prepare grammatically correct sentences as per given instruction LE1.2 Speak on a given topic using grammatically correct sentences.	Unit-1.0 English Grammar 1.1 Basic Sentence Patterns 1.2 Infinitives 1.3 Modifiers 1.4 Degree 1.5 Narration 1.6 Adverbial Phrases 1.7 Conjunctions 1.9 One Word Substitution from the prescribed text.	<ul style="list-style-type: none"> One Word Substitution Rearrangement of Jumbled words

SW-1 Suggested Sessional Work (SW):

- a. **Assignments:**
 - i. Exercises on the topic: Modifiers, Narration, Infinitives, 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.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO2.1 Explain the 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 2.3 Barriers of Communication:	<ul style="list-style-type: none"> Collect data about good postures, expressions, visuals related to non verbal communication for Effective Communication.

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Session Outcomes	Laboratory Instruction	Class room Instruction	Self Learning (SL)
		Physical, Semantic and Socio-psychological	

SW-2 Suggested Sessional Work (SW):

- **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.
- **Mini Project:**
 - i. Seminar on topics related to "Role of non verbal communication for developing effective communication in technical education".
- **Other Activities (Specify):**
 - i. Role play on given theme such as: When a student gets exceptionally good marks or less marks in 10th 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 Draft letters, notices, circulars using correct format.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO3.1 Draft business letters. SO3.2 Draft Job application and Resume SO3.2 Use technical style and mechanics for drafting business letters	LE3.1 Write short paragraphs for social cause & newspapers. LE3.2 write letter of complaint and enquiry.	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 Mechanics and Style 3.2.4 Types of Business Letters Applications for Job & Resume Writing 3.2.5 Letter of Enquiry 3.2.6 Letter for Order Placement 3.2.7 Letter of Complaints/Faults (to appropriate authorities)	• Read the sample letter, circular, notice, case and paragraph on selected theme on Internet.

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-3 Suggested Sessional Work (SW) :

- **Assignments:**
 - i. Prepare summary of the given incident in the shop floor/office/institute.
 - ii. Write an application to apply for campus recruitment drive to be held in your college.
 - iii. 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 report in prescribed format.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Explain style and mechanics of a good report. SO4.2 Prepare project report as per given direction SO4.3 Prepare Technical reports in given format. SO4.4 Draft Notices and circulars	LE4.1 Prepare reports on given situations	Unit 4.0 Technical Report Writing 4.1 Characteristics of a Good Report. 4.2 Forms of Technical Report 4.3 Types of Technical Report. 4.4 Format of Project Report, Guidelines for writing Project Report, Notices and Circulars.	<ul style="list-style-type: none"> • Read and practice different Types of Reports.

SW-4 Suggested Sessional Work (SW) :

- a. Assignments:**
 - i. Prepare notice and circular for your class/department as per given directions.
 - ii. Describe qualities of a good report.

- 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.

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

Unit Number	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
I	English Grammar	4	8	18	30
II	Non verbal communication	2	5	8	15
III	Paragraph & Letter Writing	3	7	15	25
IV	Technical Report writing	3	7	20	30
Total		12	31	57	100

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

K) 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

L) Suggested Learning Resources:

(a) Books :

S. No.	Title	Author	Publisher	Edition & Year
1	English Grammar in Use	Murphy Raymond	Cambridge Publications	4 th 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

(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. [language-labs.com](http://www.language-labs.com/)
13. www.wordsworthelt.com

(c) Others:

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

M) 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 – Globalina, A-One Solutions, Wordsworth, Spears	All
3.	Computer tables & chairs	Depending upon the size of the Language Lab	All

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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 Use grammatically correct sentences in Speaking & Writing.	2	1	1	1	-	-	-	1	2	3	1	1
CO-2 Demonstrate appropriate non-verbal expression while communicating with others.	1	1	2	2	-	-	-	2	2	3	1	1
CO-3 Draft letters, notices and circulars using correct formats.	1	1	1	2	-	-	-	1	3	2	1	1
CO-4 Draft different types of report in prescribed format.	2	1	2	2	-	1	-	2	3	2	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

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O) Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,8,9,10 PSO 1,2	CO-1 Use grammatically correct sentences during Speaking & Writing.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	LE1.1 LE1.2	Unit-1.0 English Grammar 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7	As mentioned in page 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, 2.3, 2.4, 2.5	
PO 1,2,3,4,8,9,10 PSO 1,2	CO-3 Draft letters, notices and circulars using correct formats	SO3.1 SO3.2	LE3.1	Unit-3.0 Short Stories 3.1 , 3.2,3.3,3.4	
PO 1,2,3,4,6,8,9,10 PSO 1,2	CO-4 Draft different types of report in prescribed format.	SO4.1 SO4.2 SO4.3	LE4.1	Unit- 4.0 Passages for Comprehension 4.1, 4.2, 4.3, 4.3, 4.4, 4.5, 4.6,4.7,4.8	

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

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- A) Course Code : 200252 (14)
 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 a large range of 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 Credit L+(P+T)/2
1.	Applied Science	200252 (14)	Applied Maths-II	3	-	1	4

Legend: L-Lecture, P-Practical, T-Tutorial

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	200252 (14)	Applied Maths-II	100	20	30	-	-	150

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

- Note:** i. Separate passing is must for End Semester Assessment.
 ii. Separate passing is must for Classroom Assessment (Theory)

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 (CI), Laboratory Instruction (LI), 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: 12)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	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.	1.1 (a) Rules of integration 1.2 (a) 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.

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

(Approx. Hrs: 18)

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

SW-2 Suggested Sessional Work (SW):

- **Assignments:**
 - i. Enumerate the area of irregular shapes by using concept of integration.
 - ii. Explore the use of definite integrals related to engineering applications.
- **Mini Project:**
 - i. Prepare charts showing area of irregular shapes using concept of integration.
- **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: 18)

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

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: 12)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO4.1 Determine the roots of given equations using Bisection 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	4.1(a) Roots of equations by Bisection Method
SO4.2 Calculate the roots of given equations using Regula Falsi method.			4.2(a) Roots of equations using Regula Falsi Method
SO4.3 Compute the roots of given equations using Newton-Raphson method.			4.3(a) 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: 20)

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Apply the concept of Numerical integration to find area from given data by Trapezoidal 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	5.1(a) Integration by Trapezoidal rule.
SO5.2 Utilize the concept of Numerical integration to find area from given data by Simpson's one			5.2(a) Integration by Simpson's one-third rule.

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Session Outcomes (SOs)	Laboratory	Class room Instruction (CI)	Self Learning (SL)
third rule SO5.3 Use the concept of Numerical integration to find area from given data by Simpson's three eighth rule.			5.3(a) Integration by Simpson's three eighth rule.

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

SW-5 Suggested Sessional Work (SW):

a. Assignments:

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

a. Mini Project:

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

b. Other Activities (Specify):

- Identify engineering problems based on real world problems with the use of free tutorials available on the Internet.
- Use graphical software EXCEL, D-PLOT and GRAPH for related topics.
- 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	4	6	10	20
II	Applications of Integral Calculus	4	6	10	20
III	Differential equations of first order and first degree	4	6	10	20
IV	Numerical Solutions of Equations	4	6	10	20
V	Numerical Integration	4	6	10	20
Total		20	30	50	100

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

Note: Only one experiment has to performed at the end semester examination of 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 :

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
5. www.easycalculation.com

(c) Others:

5. Learning Packages.
6. Lab Manuals.
7. Manufacturers' Manual
8. Users' Guide

M) List of Major Laboratory Equipment and Tools: NA

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

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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	√	√	√	-	-	-	-	√	√	√		

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title.	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	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)

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others),LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

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- A) Course Code : 200253 (14)
 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	Credit L+(P+T)/2
1	Applied Science	200253 (14)	Applied Chemistry	3	-	1	4
2	Applied Science	200261 (14)	Applied Chemistry (Lab)	-	3	-	2

Legend: L-Lecture, P-Practical, T-Tutorial

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	200253 (14)	Applied Chemistry	100	20	30	-	-	150
2	Applied Science	200261 (14)	Applied Chemistry (Lab)	-	-	-	50	20	70

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

- Note: i. Separate passing is must for End Semester Assessment.
 ii. Separate passing is must for Classroom Assessment (Theory)

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Semester - II

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 (CI), Laboratory Instruction (LI), 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.

Convert unit of the given physical quantity from one unit system to other.

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

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	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.	<ul style="list-style-type: none"> 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.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	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.	<p>Unit-2.0 (A) Water Treatment</p> 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 Ion 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 <p>Unit-2.0 (B) Polymer</p> 2.1 Classification of polymer 2.2.1 Types of rubber : 2.2.2 Natural and, synthetic, 2.2.3 processing of natural rubber. Synthetic rubber 2.2.4 Properties and applications of Buna-N, Thiokol, Neoprene.	<ul style="list-style-type: none"> • Hardness • Types of Hardness

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.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	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.	<p>Unit-3.0 (A) Electrochemistry and Batteries</p> 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 <p>Unit-3.0 (B) Electrical Insulator and thermocouple alloy</p> 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: <ul style="list-style-type: none"> • Nature of solute, • Nature of solvent, • Temperature, • Concentration or dilution.

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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 effects on 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.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
<p>SO4.1 Extract the ore from chemical reaction for industrial application</p> <p>SO4.2 Prepare the metal alloy for industrial application.</p> <p>SO4.3 Use the Refractory material for industrial applications.</p>	<p>LE4.1 Determine the percentage of copper in given copper ore.</p> <p>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.</p>	<p>Unit- 4.0 (A) Metallurgy</p> <p>4.1 Metallurgy: 4.1.1 Mineral, 4.1.2 Ore, 4.1.3 Gangue, 4.1.4 Flux, 4.1.5 Slag.</p> <p>4.2 Metallurgical process of iron and copper</p> <p>Unit- 4.0 (B) Metal Alloys</p> <p>4.1 Properties of metals like copper, aluminum, tungsten, platinum nickel.</p> <p>4.2 Ferrous alloys: 4.2.1 Low carbon 4.2.2 Medium carbon 4.2.3 High carbon steels.</p> <p>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</p> <p>Unit-4.0 (C) Cement:</p> <p>4.1 Portland cement, 4.1.1 Constituent 4.1.2 Setting and Hardening.</p>	<ul style="list-style-type: none"> • Properties of metals like copper, aluminum, tungsten, platinum nickel.

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Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

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.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 Select the relevant fuel for industrial applications.	LE4.1 Determine the moisture content, ash and volatile matter in given coal sample using proximate analysis.	Unit-5.0 (A) Fuel and Combustion	<ul style="list-style-type: none"> • Classification of fuel. • Solid fuel classification. • Octane number and Cetane number.
SO5.2 Test the quality of coal for industrial uses.	LE4.2 Determine the calorific value of the given solid fuel using Bomb calorimeter.	5.1 Fuel: Calorific value and ignition temperature, classification.	
SO5.3 Perform fractional distillation process for refining of petroleum in industries.	LE4.3 Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer –I	5.2 Solid fuels: Coal, Classification and composition , 5.2.1 Proximate analysis, 5.2.2 Ultimate analysis, 5.2.3 Bomb calorimeter.	
SO5.4 Test the properties of the given lubricant for industrial applications.	LE4.4 Determine the flash and fire point of given lubricating oil using Cleavland open cup apparatus.	5.2 4 Carbonization of coke by Otto Hofmann's oven.	
SO5.5 Identify the different ingredients of paints and varnish for engineering	LE4.5 Determine the cloud and pore point of the given lubricant.	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,	
	LE4.6 Separate the various		

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Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	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 point 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.

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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	8	7	5	20
II	Water Treatment and Polymer	5	5	10	20
III	Electrochemistry, Batteries, Insulator and Electrical Thermocouple	8	6	6	20
IV	Metallurgy, Metal Alloys and Cements	5	7	8	20
V	Fuel and Combustion, Lubricants, Paints Varnish	8	5	7	20
Total		34	30	36	100

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	Cleveland 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

K) Suggested Instructional/Implementation Strategies:

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

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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 :

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

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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/lb; 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

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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

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	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 page 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	

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

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Semester - II

- A) Course Code : 200254 (14)
 B) Course Title : Applied Physics
 C) Pre- requisite Course Code and Title :
 D) Rationale :

Engineering diploma holders have to deal with physical properties of various materials, measurements of physical quantities, basic tools, and maintenance of machines in the industrial environment. Diploma holder must have a skill to apply the knowledge of basic concepts and principles of measurements, mechanics, waves, properties of materials, motion, friction, fluid mechanics, optics, optical instruments, electricity, magnetism and modern physics in solving broad based engineering problems. This course of engineering physics helps diploma engineers to achieve the course outcomes and provide sound background for self-development in future to cope up with new innovations.

E) Course Outcomes:

- CO-1 Estimate errors in measurement of physical quantities.
 CO-2 Solve mechanics related engineering problems by applying the knowledge of forces and properties of materials.
 CO-3 Solve engineering problems using relevant optical equipment by applying the principles of ray optics.
 CO-4 Apply concepts of electrostatics, magnetism and electricity to solve engineering problems.
 CO-5 Solve engineering problems by applying the knowledge of modern physics.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Credit L+(P+T)/2
1	Applied Science	200254 (14)	Applied Physics	3	-	1	4
2	Applied Science	200262 (14)	Applied Physics (Lab)	-	3	-	2

Legend: L-Lecture, P-Practical, T-Tutorial

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	200254 (14)	Applied Physics	100	20	30	-	-	150
2	Applied Science	200262 (14)	Applied Physics (Lab)	-	-	-	50	20	70

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

- Note: i. Separate passing is must for End Semester Assessment.ss
 ii. Separate passing is must for Classroom Assessment (Theory)

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 (CI), Laboratory Instruction (LI), Tensional 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 Estimate errors in measurement of physical quantities.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO1.1 Convert unit of the given physical quantity from one-unit system to other. SO1.2 Derive the formula of derived physical quantity using dimensional analysis. SO1.3 Calculate the error in the given measurement with justification.	LE1.1 Use Vernier Calipers to measure the dimensions of given object in significant figures and estimate errors precisely. LE1.2 Use Screw gauge to measure the dimensions of given object in significant figures and estimate errors precisely. LE1.3 Use Spherometer to measure the dimensions of given objects in significant figures and estimate error precisely.	Unit-1.0 Units, Measurement and Error analysis 1.1 Unit of physical quantity 1.11 Fundamental and derived unit 1.2 Unit system 1.21 CGS, MKS and SI (a) Advantages/disadvantages of SI unit system (b) Seven basic and Supplementary units. 1.3 Dimensional Analysis 1.31 Dimensional formula and equations. 1.32 Applications of Dimensional equations. 1.33 Numerical problems on Dimensional analysis. 1.4 Measurement 1.41 Accuracy, Precision and Errors. 1.42 Absolute, Relative and percentage Error. 1.5 Significant figures and rounding off.	1.21(a) Advantages/disadvantages of SI unit system 1.21 (b) Seven basic and Supplementary units

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Measure dimensions of class room, house hold items, thickness of paper, aluminum foil, iron bar and items found in surroundings.
- ii. Analyze the correctness of given physical relation using dimensional analysis.
- iii. Identify the instruments used for measurement of seven fundamental quantities.
- iv. Identify instruments used for measurement of derived quantities.

b. Mini Project:

- i. Prepare working model of measuring instruments – Vernier Calipers, screw gauge.
- ii. Collect low dimension items from household and market and calculate the thickness with the help of Vernier Calipers and screw gauge.

c. Other Activities (Specify):

- i. Seminar on Errors in measurements.
- ii. Seminar on precision and accuracy of any instrument.

CO-2 Solve mechanics related engineering problems by applying the knowledge of forces and properties of materials.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO2.1 Classify conservative and non-conservative forces in a given situation. SO2.2 Explain Gravitational forces and related constants at given place. SO2.3 Differentiate between types of Moduli of elasticities for given solids. SO2.4 Select a given fluid on the basis of surface tension and viscosity.	LE2.1 Determine g using simple pendulum. LE2.2 Determine terminal velocity of given object by Stoke's law apparatus. LE2.3 Determine surface tension of water by Capillary rise method.	<p>Unit-2.0 Force and General Properties of matter</p> <p>2.1 Force</p> 2.11 Types of Forces (a) Conservative and non-conservative forces (b) Frictional Forces, Limiting static and dynamic friction. (c) Centripetal and centrifugal force and their illustration. (d) Gravitational Force 'G' and 'g' and their interrelation, Factors affecting 'g' <p>2.2 Elasticity</p> 2.21 Hooke's law (a) Elastic limit and elastic fatigue 2.22 Moduli of elasticities (a) Young's modulus, Bulk Modulus, Shear modulus of rigidity <p>2.3 Surface Tension</p> 2.31 Molecular force, surface energy, effect of temperature 2.32 Cohesive and adhesive force 2.33 Excess pressure and its	2.11. Types of Forces. (d) Factors affecting 'g' 2.21 (a) Elastic limit and elastic fatigue 2.32 Cohesive and adhesive force 2.42 Streamline and turbulent flow

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Session Outcomes	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
		illustration, rise of liquid in capillary tube 2.4 Viscosity 2.41 Coefficient of viscosity, Newton's law of viscosity 2.42 Streamline and turbulent flow, Reynolds number 2.43 Poiseuille's equation (no derivation of formula), Stoke's law and their applications	

SW-2 Suggested Sessional Work (SW):

a. Assignments:

- i. Find the value of 'g' at different locations of India and justify the reasons for variations.
- ii. Enumerate the examples of conservation of angular momentum in day to day life.
- iii. Enumerate the applications of surface tension in daily life.
- iv. Explore the use of different liquid on the basis of their viscosity.

b. Mini Project:

- i. Prepare a setup to show frictionless motion on slanting surface.
- ii. Prepare a model to compare elasticity of different materials.

c. Other Activities (Specify):

- i. Seminar on artificial and natural satellite.
- ii. Seminar on weightlessness in lifts and space.

CO-3 Solve engineering problems using relevant optical equipment by applying the principles of ray optics.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO3.1 Compare the wavelength and frequency of different components of electromagnetic spectrum and locate visible range.	LE3.1 Calculate refractive index of material of glass slab. LE3.2 Calculate refractive index of material of glass prism. LE3.3 Calculate focal length of convex/concave lenses accurately. LE3.4 Determine the Critical	Unit-3.0 Optics, optical instruments and optical fibers a. Refraction 3.11 Laws of refraction 3.12 Lenses and combination of lenses b. Absolute and relative refractive index 3.13 Refraction	3 b. Absolute and relative refractive index 3.32 Applications of TIR

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Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
<p>SO3.2 Explain the phenomena of total internal reflection in optical fiber.</p> <p>SO3.3 Select materials on the basis of refractive index.</p>	<p>angle for total Internal reflection of given medium w. r. t. air.</p> <p>LE3.5 Determine Numerical aperture of Optical fiber</p>	<p>through prism, Angle of minimum deviation and its relation</p> <p>c. Total internal reflection of light</p> <p>3.31 Critical angle.</p> <p>3.32 Applications of TIR</p> <p>3.33 Optical fiber, NA of Optical fiber</p> <p>3. 4 Optical instruments</p> <p>3.41 Simple and compound microscope</p> <p>3.42 Spectrometer</p> <p>3.5 Electromagnetic spectrum</p> <p>3.31 Pure and Impure spectrum, Visible range</p>	

SW-3 Suggested Sessional Work (SW):

a. Assignments:

- i Write details of method of finding refractive index of liquid using hollow prism
- ii Prepare detail report on the frequency range of electromagnetic waves interaction in daily life.

b. Mini Project:

- i Prepare working model to demonstrate the TIR in Optical fiber.
- ii Prepare model of microscope with house hold materials and lens.

c. Other Activities (Specify):

- i. Visit to BSNL like organizations to observe the role of optical fibers in communication.
- ii. Seminar on industrial application of Optical fiber

CO-4 Solve electrical engineering problems by applying concepts of electrostatics, magnetism and electric current.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO4.1 Explain Coulomb's law, electric potential and electric field for given charge distribution. SO4.2 Determine capacity of a capacitor with given dielectric materials. SO4.3 Use Ohm's law for different combinations of resistance to calculate current and potential difference.	LE4.1 Use Ohm's law to calculate unknown resistance in a given circuit. LE4.2 Determine the resistance of given circuits by applying series and parallel combination of resistance. LE4.3 Determine the specific resistance of the given material by using meter bridge. LE4.4 Use deflection magnetometer for comparison of magnetic moments of two bar magnets. LE4.5 Draw the magnetic lines of forces using bar magnet and compass needle. LE4.6 To compare e.m.f of two cells using potentiometer. LE4.7 To determine internal resistance of a cell.	Unit-4.0. Electrostatics, Magnetism and Current Electricity 4.1 Electric Charge, Coulomb's Law 4.2 Electric Field, Potential, Potential Difference between Two Points, Equipotential Surfaces 4.3 Types of dielectrics and dielectric Strength 4.4 Capacity, Units, Principle of Capacitor 4.41 Factors Affecting Capacity, type of capacitors 4.5 Magnetism: - 4.51 Magnetic lines of force, lines of induction, 4.6 Current Electricity 4.61 Resistance, Specific resistance 4.62 Series and parallel combination of resistance 4.63 Internal resistance of a cell 4.64 Potential difference and e.m.f of a cell 4.65 Combination of cells in series and in parallel. 4.66 Simple applications of Wheatstone bridge, metre bridge and Potentiometer. 4.67 Electrical power	4.2 Equipotential Surfaces 4.41 Factors affecting Capacity, types of capacitors 4.61 Specific resistance 4.62 Wheatstone Bridge principle applications

SW-4 Suggested Sessional Work (SW):

a. Assignments:

- i. Prepare list of dielectric materials with dielectric constant.
- ii. Analyze the role of resistance and capacitors in house hold electrical items viz. electric fans etc.
- iii. Prepare list of instruments/ equipment's using Magnets in house hold appliances and Labs.

b. Mini Project:

- i. Prepare working models of capacitors.
- ii. Collect some resistance and capacitors from nearby electrical shops and measure its value using multi-meter.
- iii. Prepare circuits with LED to illustrate the series and parallel combination of resistance.
- iv. Prepare cells using different electrolytes.

c. Other Activities (Specify):

- i. Seminar on applications of resistance and capacitors.
- ii. Market survey for availability of electronic items in the local market.
- iii. Calculate domestic monthly electricity bill.

CO- 5 Solve engineering problems by applying the knowledge of modern physics.

Session Outcomes (SOs)	Laboratory Instruction (LI)	Class room Instruction (CI)	Self-Learning (SL)
SO5.1 Apply the knowledge of photoelectric effect and X-rays in a given situation. SO5.2 Compare laser with other sources of light. SO5.3 Explain the working principle and applications of Optical fiber	LE5.1 Calculate the work function of given photoelectric materials accurately. LE5.2 Calculate the divergence of given laser.	UNIT 5. Modern Physics 5.1 Photoelectric effect 5.11 Laws of photoelectric emission, Photoelectric equation and threshold frequency 5.12 Photo cell 5.2 X-rays 5.21 Production of X rays, properties & uses. 5.3 Laser 5.31 Spontaneous and stimulated emission 5.32 population inversion, pumping scheme and active system Ruby Laser and semiconductor laser 5.4 Ultra-sonics 5.41 Frequency range 5.42 Methods of production- Magnetostriction & Piezo electric method 5.43 Properties of ultra-sonics 5.44 Applications of ultra-sonics.	5.12 Photo cell 5.21 Properties & uses of X rays. 5.43 Applications of Optical Fiber

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Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self-Learning

SW-5 Suggested Sessional Work (SW):

a. Assignments:

- v. To study different medical applications of ultra-sonics and X-rays.
- vi. Prepare list of type of laser used in office and house hold devices.

b. Mini Project:

- i. To design a working model for the production of ultra-sonics.
- ii. Determine the divergence of key chain laser purchased from local market.

c. Other Activities (Specify):

- i. Seminar on industrial applications of ultra-sonics.
- ii. Seminar on X ray.
- iii. Seminar on engineering applications of laser

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	Units, Measurement and Error analysis	8	5	7	20
II	Forces and General Properties of matter	5	5	10	20
III	Optics, optical instruments and optical fibers	8	6	6	20
IV	Electrostatics, Magnetism and Current Electricity	5	8	7	20
V	Modern Physics	6	7	7	20
Total		32	31	37	100

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

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

Laboratory Instruction Number	Short Laboratory Experiment Title	Assessment of Laboratory Work (Marks)		
		Performance		Viva-Voce
		PRA	PDA	
LE1.1	Vernier Calipers	15	25	10
LE1.2	Screw gauge	15	25	10
LE 1.3	Spherometer	15	25	10
LE2.1	Young modulus	25	15	10
LE2.2	'g' by Simple pendulum	25	15	10
LE2.3	Viscosity of liquid	25	15	10
LE2.4	Surface tension by capillary rise method	25	15	10
LE3.1	Refractive index of glass slab	20	20	10
LE3.2	Combination of lens	25	15	10
LE3.3	Refractive index of Prism	20	20	10
LE4.1	Ohm's Law	15	25	10
LE4.2	Series and parallel combination of resistance	25	15	10
LE4.3	Specific Resistance	25	15	10
LE 4.4	Deflection galvanometer	25	15	10
LE4.5	Magnetic lines of Forces	20	20	10
LE4.6	Comparison of e.m.f of cells	20	20	10
LE4.7	Internal resistance of a cell	20	20	10
LE5.1	Photo electric effect	20	20	10
LE5.2	Diode laser	15	25	10

50 Marks are allocated for performance under ESE.

* 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 performed at the end semester examination of 50 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:

(b) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Fundamentals of Physics	Halliday, David; Resnik, Robert and Walker, Jearl	John Wiley and sons	Tenth edition 2013
2	The Feynman Lectures on Physics	Feynman P.Richar, B. LeightonRobert Sands Matthew	Pearson Education India	First edition 2012
3	University physics	Young Hugh,Freedman Roger	Pearson Education India	Thirteenth Edition 2013

(b) Open source software and website address:

1. Some relevant Experiments: <http://cdac.olabs.edu.in>
2. VernierCalipers:<http://www.tutorvista.com/physics/animations/vernier-callipers-animation>
3. Screw gauge: www.notesandsketches.co.uk/Measuring_Tools_Small.swf
4. <http://www.stefanelli.eng.br/en/virtual-vernier-caliper-simulator-05-millimeter>
5. Some relevant Experiments and theory topics:
<https://phet.colorado.edu/en/simulations/category/physics>
6. Photoelectric effect: <http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1>
7. Deflection magneto meter: http://emv-au.vlabs.ac.in/Deflection_Magnetometer/
8. Laser: <https://spaceplace.nasa.gov/laser/en/>

(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 Equipment	Broad Specifications	Relevant Experiment Number
1	Vernier calipers	Stain less steel body, Range: 0-150mm ,Resolution: 0.1mm	LE1.1
2	Screw gauge	Stainless steel spindle and ratchet top brass body with satin chrome finish. Graduated to read up to 25mm in 0.01mm divisions with screw pitch of 0.5mm, ratchet lock nut	LE 1.2
3	Spherometer	Brass double disc superior quality, stainless steel legs and screw 1/100mmpitch each.	LE1.3
4	Pendulum apparatus for determination of 'g'	200 mm diameter metal wheel mounted with fixed stand and a meter scale, stop watch to measure time. steel case fly back action least count 1/10 th or 1/5 th of second	LE2.2
5	Stoke's Law apparatus	Glass tube (~1-inch diameter and length ~ 1 m) with stand, timer, steel sphere, glass beads	LE2.3
6	Surface tension set up	Travelling microscope with horizontal and vertical movement (LC 0.001 cm), capillarytube, beaker, pin fixed on adjustable stand	LE2.4
7	Glass slab	Rectangular, all sides polished, made from slightly greenish glass free from bubbles,75*50*18 mm	LE3.1
8	Glass Prism	Equilateral or right angled, from bubble free boro crown glass 38 x 38	LE 3.2
9	Ohm's law apparatus	Box type with D.C meter to verify ohm's law with fitted ammeter & voltmeter	LE4.1
10	Post Office Box	Complete set in polished wooden box, Split brass contact blocks holding precision cut, interchangeable plug having molded black fluted tops. Coils of constantan wire with 4 pair of ratio arms.	LE4.2
12	MeterBridge (Wheatstone Bridge)	Sun mica top, two gap type having lock type terminals with pencil jockey.	LE4.3
13	Deflection magnetometer	Wooden base length~ 1 m, magnetic compass, meter scale and magnets	LE4.4

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14	Bar magnet	Alnico size 3" - 4"	LE 4.5
15	Potentiometer	10K Ohm 500mW Linear Slide Potentiometer. About 10 m wire of Manganin and constantan with high resistivity and low temperature coefficient stretched on a wooden board attached with a meter scale and pencil jockey.	LE 4.6 LE 4.7
16	Photoelectric apparatus	Includes photo cell, light sources, voltmeter, ammeter	LE5.1
17	Diode laser	Power 5 mW, randomly polarized	LE5.2

N) Mapping of POs & PSOs with COs:

Course Outcomes (COs)	Programme Outcomes (POs)										Programme Specific Outcomes (PSOs)	
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PSO-1	PSO-2
CO-1	3	2	3	-	-	-	1	1	2	1		
CO-2	3	2	2	1	-	1	-	1	1	1		
CO-3	3	2	2	1	1	1	-	1	1	1		
CO-4	3	1	1	1	1	1	1	1	1	1		
CO-5	3	1	1	-	-	-	-	1	-	1		

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O) Course Curriculum Map:

POs No.	COs No.	SOs No.	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self-Learning (SL)
PO-1,2,3,7,8,9,10 PSO---	CO-1	SO1.1 SO1.2 SO1.3	LE1.1 LE1.2 LE1.3	Unit-1.0 Units, Measurement and Error analysis 1.1, 1.2,1.3,1.4,1.5	1.21 (a) 1.21 (b)
PO-1,2,3,4,6,8,9,10 PO-10 PSO-----	CO-2	SO2.1 SO2.2 SO2.3 SO2.4	LE2.1 LE2.2 LE2.3	Unit-2.0 Forces and General Properties of matter 2.1,2.2,2.3,2.4	2.11 d 2.21 a 2.32 a 2.42
PO-1,2,3,4,5,6,8,9,10 PSO-----	CO-3	SO.3.1 SO3.2 SO3.3 SO3.4	LE3.1 LE 3.2	Unit-3.0 Optics, optical instruments and optical fibers 3.1,3.2,3.3,3.4	3.3 d 3.4 d 3.5 b
PO-1,2,3,4,5,6,7,8,9,10 PSO-----	CO-4	SO4.1 SO4.2 SO4.3	LE4.1 LE4.2 LE4.3 LE4.4 LE4.5 LE 4.6 LE4.7	Unit-4.0 Electrostatics, Magnetism and Current Electricity 4.1,4.2,4.3,4.4,4.5, 4.6	4.2 4.41 4.61 4.62
PO-1,2,3,8,10 PSO-----	CO-5	SO5.1 SO5.2 SO5.3	LE5.1 LE5.2	Unit-5.0 Modern Physics 5.1,5.2,5.3,5.4,	5.12 5.21 5.43

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others) , LI : Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self-Learning

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Semester - II

- A) Course Code : 200255 (37)
 B) Course Title : Basic Non Conventional Energy Sources
 C) Pre- requisite Course Code and Title :
 D) Rationale :

In the context of rapidly depleting fossil fuel resources and increasing power demand along with environmental concern it is imperative to look for the alternative sources of energy. Non conventional energy sources are feasible options to cope up the need to develop sustainable energy systems. It is hoped that with the advancement in technology and research efforts in the field of development of non-conventional sources of energy, these sources may prove to be cost-effective as well. The future of Wind, Solar, tidal and other energy sources is bright and these will play an important role in the world energy scenario and future employments. This course aims at developing the ability in the students to cope up with the working, construction and maintenance aspects of machinery, devices and components associated with these systems.

E) Course Outcomes:

- CO-1 Explore the role and prospects of non-conventional energy sources.
 CO-2 Explain construction, working and maintenance of Solar energy devices and components.
 CO-3 Describe construction and working of Wind energy related systems and subsystems.
 CO-4 Explain construction, working and maintenance of Biomass plants.
 CO-5 Describe construction and working of Geothermal, OTEC, Tidal and Micro Hydel energy systems and subsystems.
 CO-6 Explore the utility of fuel cell and hydrogen energy in various areas.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Credit L+(P+T)/2
1	Mechanical Engineering	200255 (37)	Basic Non Conventional Energy Sources	1	-	1	2
2	Mechanical Engineering	200263 (37)	Basic Non Conventional Energy Sources (Lab)	-	3	-	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.

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	200255 (37)	Basic Non Conventional Energy Sources	-	-	30	-	-	30
2	Mechanical Engineering	200263 (37)	Basic Non Conventional Energy Sources (Lab)	-	-	-	50	20	70

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- **PROGRESSIVE ASSESSMENT: (50 MARKS)**
 1. CLASSROOM ASSESSMENT (CA) : (a) CLASS TEST(CT) - Nil
(b) TEACHER'S ASSESSMENT (TA) – 30 (Sessional work (SW) -20, Attendance (ATT) -10)
 2. LABORATORY ASSESSMENT (LA): TEACHER'S ASSESSMENT (TA) – 20 (PRA – 10, PDA -5, VIVA VOICE -5)
- **END SEMESTER ASSESSMENT (ESE): (50 MARKS)**
 1. END SEMESTER EXAM (ESE-THEORY)- Nil
 2. END SEMESTER EXAM (ESE-PRACTICAL) ESE - 50

Legend: PRA: Process Assessment, PDA: Product Assessment

- Note:**
- i. Separate passing is must for TA component of Progressive assessment, both for theory and practical.
 - ii. Separate passing is must for End Semester Exam (Theory) and End Semester Exam (Practical).

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 Explore the role and prospects of non-conventional energy sources.

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

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO1.1 Classify the Conventional and non-Conventional energy sources. SO1.2 Explain the role of energy in nation's development. SO1.3 Explore the prospects of renewable energy sources.		Unit-1.0 Energy sources 1.1 Conventional and non- Conventional energy sources. 1.2 Energy consumption as a measure of Nation's development; strategy for meeting the future energy requirements Global and National scenarios. 1.3 Non-conventional energy- Seasonal variations and availability. Renewable energy – sources and features. 1.4 Hybrid energy systems, Distributed energy systems and dispersed generation (DG). 1.5 Prospects and Achievements of renewable energy sources in India in general and Chhattisgarh state in particular. 1.6 Issues related to power generation through renewable energy sources.	<ul style="list-style-type: none"> • Issues related to power generation through renewable energy sources.

SW-1 Suggested Sessional Work (SW):

a. Assignments:

- i. Survey the literatures to establish the patterns of energy use in industry.
- ii. Quantify the harmful effects of pollutants from conventional energy sources.
- iii. Prepare a chart of cumulative achievements of renewable energy sources in India

b. Mini Project:

- i. Demonstrate the working principle of non conventional energy devices (at least three) with the help of classroom models.

c. Other Activities (Specify):

- i. Seminar on Quantum numbers.

CO-2 Explain construction, working and maintenance of Solar energy devices and components.

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

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Explain Beam and diffuse radiation.	LE2.1 Study of Solar Radiation by using Pyranometer.	Unit-2.0 Solar energy 2.1 Solar radiation: Beam and diffuse radiation, Solar constant, earth sun angles, attenuation and measurement of Solar radiation, local Solar time, derived Solar angles. 2.2 Flat plate collectors, concentrating collectors, elements, working and maintenance. 2.3 Solar air heaters-types, Solar driers, elements, working and maintenance. 2.4 Storage of Solar energy-thermal storage, Electrical storage, Chemical storage. 2.5 Solar water heaters, Solar distillation, Solar still, Solar cooker, elements, working and maintenance. 2.6 Photo voltaics - Solar cells & its applications, Solar panels, Solar PV pump, Solar Home lighting systems, Solar street lights, elements, working and maintenance.	<ul style="list-style-type: none"> • Estimation of Solar energy constants. • Seasonal Solar energy variations effects on Solar devices.
SO2.2 Explain earth sun angles.	LE2.2 Study of working of Solar Distillation or Solar Still.		
SO2.3 Enumerate the uses of Solar energy collectors.	LE2.3 Study / Demonstration of working of photovoltaic cells available in the lab.		
SO2.4 Explain the utility of low cost Solar cooker as alternative cooking appliances in villages.	LE2.4 Demonstration/ study of working of solar water heater.		
SO2.5 Describe the construction, working and maintenance of Solar energy devices.	LE2.5 Demonstration/ study of working of solar cooker		
SO2.6 Select photo-voltaic cells for domestic lightning in houses.	LE2.6 Study of solar water heating system of 120 litre/day capacity for the institute's hostel.		
	LE2.7 Demonstration/ Study of working of Solar pump and calculate its discharge		

SW-2 Suggested Sessional Work (SW) :

a. Assignments:

- i. Determine the collector efficiency of Solar flat plate collector.
- ii. Identify the basic components of Solar water heater.
- iii. Determine the collector efficiency of concentrating type flat plate collector.
- iv. Identify of basic components of photo voltaic cell.
- v. Identify of basic components of Solar cooker.

b. Micro Project:

- i. Construct a model of low cost Solar cooker.
- ii. Explore different methods for tilting the axis of Solar collector to adjust for variation in Solar energy during different hours of day.

c. Other Activities (Specify):

- i. Justify the use of Solar water heater as non conventional energy devices.
- ii. Identify ways of storing Solar energy in the form of Chemical Energy, Thermal energy, Electromagnetic energy, Mechanical Energy, Electrical energy.

CO-3 Describe construction and working of Wind energy related systems and subsystems.

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

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO3.1 Explain the energy conversion process in Wind mill. SO3.2 Describe the functions of basic elements of Wind mill. SO3.3 Classify Wind mills based on shaft position. SO3.4 Perform maintenance of Wind mills and turbines components.	LE3.1 Demonstration/ study of the working of a windmill.	Unit-3.0 Wind energy 3.1 Principle of Wind energy conversion; Basic components of Wind energy conversion systems. 3.2 Wind mill components, various types and their constructional features. 3.3 Maintenance of Wind mills and turbines.	<ul style="list-style-type: none"> • Performance parameters of Wind mill. • Sites selection criterion for Wind mill installation in the country.

SW-3 Suggested Sessional Work (SW) :

• Assignments:

- i. Prepare a demonstration model of Wind energy conversion system
- ii. Compare horizontal and vertical Wind mill.
- iii. Explore the potential sites for Wind mill installation in india.

• Micro Project:

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- i. Prepare a report on various types of gear boxes used in Wind mills and turbines.
- ii. Prepare a list of mechanical components used in Wind mills and turbines.

- **Other Activities (Specify):**

- i. Collect videos and user manuals related to maintenance of Wind mills and turbines components.

CO-4 Explain construction, working and maintenance of Biomass plants.

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

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO4.1 Explain the constructional details of Bio gas conversion plant.	LE4.1 Visit to biogas plants, domestic community/institution for study and demonstration of biogas plants.	Unit-4.0 Energy from Biomass 4.1 Biomass conversion, technologies, Biogas generation plants, classification, advantages and disadvantages. 4.2 Constructional details, site selection, filling a digester for starting, maintaining Biogas production, Fuel properties of Bio gas, and applications of Biogas. 4.3 Maintenance of Biogas plants.	<ul style="list-style-type: none"> • Study of KVIP.
SO4.2 Designing of Biogas digester.			
SO4.3 Classify Bio gas plants.			
SO4.4 Describe the maintenance procedure of Biogas plants and components.			

SW-4 Suggested Sessional Work (SW) :

- **Assignments:**

- i. Identify the various components of Bio gas plant model.
- ii. Identify the different Bio gas digesters.
- iii. List the Performance characteristics of Bio gas plant.
- iv. Slurry treatment parameters for efficient utilization of Bio gas fuels.

- **Micro Project:**

- i. Make a small model of low cost Bio gas plant.

- **Other Activities (Specify):**

- i. Collect videos related to maintenance of Bio gas plants.

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CO-5 Describe construction and working of Geothermal, OTEC, Tidal and Micro Hydel energy systems and subsystems.

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

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO5.1 Describe working of geothermal plant. SO5.2 Explain the constructional details of micro hydel plant. SO5.3 Describe the ocean thermal energy conversion system. SO5.4 Explain construction and working of a tidal energy plant.	LE5.1 Working principle of geothermal power plant. LE5.2 Scope of Mini and Micro-hydro power plants in your state	Unit-5.0 Geothermal, Micro Hydel, Ocean Thermal Energy Conversion and Tidal Energy 5.1 Geothermal plant. 5.2 Micro Hydel plant. 5.3 Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle. 5.4 Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation.	<ul style="list-style-type: none"> Closed and open cycle OTEC plant.

SW-5 Suggested Sessional Work (SW) :

- Assignments:**
 - Identify the different parts of geothermal plant.
 - Identify different components of micro hydel plant
 - Justify the use of geothermal plant as a renewable source of energy.
 - List the site selection criterion of geothermal plant.
- Micro Project**
 - Prepare a report on performance of various Geothermal, OTEC, Tidal and Micro Hydel energy systems and subsystems available in our country.

CO-6 Explore the utility of fuel cell and hydrogen energy

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

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO6.1 Classify the types of fuel cells. SO6.2 Describe the utility of hydrogen powered vehicle.	LE6.1 Study of different types of models of fuel cells available in lab & compare them.	Unit 6.0 Fuel cells and Hydrogen Energy 6.1 Introduction, principle and operation of fuel cell, Types of fuel cells, application of fuel cells. 6.2 Introduction, Hydrogen Production methods,	<ul style="list-style-type: none"> Hydrogen-oxygen fuel cell. Environmental aspect of traditional vehicle. Limitations of use of hydrogen as a fuel.

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Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO6.3 Explain the safety measures in hydrogen energy utilization.		Hydrogen storage, hydrogen transportation, utilization of hydrogen gas, hydrogen as alternative fuel for vehicles.	

SW-6 Suggested Sessional Work (SW):

- **Assignments:**
 - i. Identify the different parts of fuel cell.
 - ii. Analyze the working of hydrogen powered vehicle.
 - iii. Describe the chemical reactions in H₂ – O₂ fuel cell.
 - iv. Enlist the practical fields where hydrogen is used as a fuel..
- **Other Activities (Specify):**
 - i. Collect state wise information of usage of Fuel cells and Hydrogen Energy through www.

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	
LE2.1	Study of Solar Radiation by using Pyranometer	30	15	5
LE2.2	Study of Solar Distillation or Solar Still	30	15	5
LE2.3	Study the photovoltaic cells available in the lab .	35	10	5
LE2.4	Demonstration/ study of solar water heater .	25	20	5
LE2.5	Demonstration/ study of solar cooker	25	20	5
LE2.6	Study of solar water heating system of 120 litre/day capacity for the institute's hostel	30	15	5
LE2.7	Study of working of Solar pump and calculate its discharge .	25	20	5
LE3.1	Demonstration/ study of the working of a windmill.	25	20	5
LE4.1	Visit to biogas plants, domestic community/institution for study and demonstration of biogas plant .	30	15	5
LE5.1	Working principle of geothermal power plant.	25	20	5
LE5.2	Scope of Mini and Micro-hydro power plants in your state	25	20	5
LE6.1	Study of different types of models of fuel cells available in lab & compare them	20	25	5

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*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 performed at the end semester examination of 50 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:

(c) Books :

S. No.	Titles	Author	Publisher and Edition*
1	Non conventional Energy Sources	G D RAI	Khanna Publishers New Delhi
2	Non-conventional Sources of Energy (Hindi)	S.S.L. PATEL	Standard Publishers and Distributors
3	Non conventional Energy Sources	BH KHAN	Tata McGraw Hill Publications
4	Renewable and Conventional energy	S Rao	Khanna Publishers New Delhi

*Latest edition of all above books should be referred

(b) Open source software and website address:

1. Introduction: <http://indiacore.com/bulletin/kssidhu-non-conventional-energy-resources.pdf>
2. Introduction : <http://www.newagepublishers.com/samplechapter/000329.pdf>
3. Wind turbines : <http://wind.machine-reliability.com/?adtype=Maschinenauf%C3%A4lle&addate=20161117&gclid=CJ350N6Wk9QCFdKHAAodYLICXw>
4. Wind turbines : <http://www.awea.org/operations-and-maintenance>
5. Wind turbines : <http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php>
6. Wind turbines : <https://www.gerenewableenergy.com/wind-energy/turbine-services/wind-turbine-maintenance.html>

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7. Wind turbines : <https://www.wind-energy-the-facts.org/operation-and-maintenance-costs-of-wind-generated-power.html>
8. Wind turbines : http://archive.northsearegion.eu/files/repository/20120320111424_PC_Skills-Compendiuminmaintenance.pdf
9. Solar panels : <https://www.thesolarco.com/how-to-maintain-your-solar-panels/>
10. Solar panels : <http://www.wikihow.com/Maintain-a-Solar-Panel>
11. Solar panels :
http://www.poweringhealth.org/Pubs/Guyana_Solar_PV_Systems_Maintenance_Guide.pdf
12. Parabolic trough collector maintenance: http://mnre.gov.in/file-manager/UserFiles/CST-Manuals/PTC_E.pdf
13. Flat plate solar collector maintenance: <http://www.htproducts.com/literature/lp-364.pdf>
14. Specifications of solar devices: <http://mnre.gov.in/information/systems-specifications/>
15. Biogas plants :
http://www.snv.org/public/cms/sites/default/files/explore/download/handbook_on_operation_and_maintenance_of_biogas_plants_bio-slurry_use_and_management.pdf
16. Biogas plants : <http://collections.infocollections.org/ukedu/en/d/Jg33ime/15.html>
17. Biogas plants : <https://www.youtube.com/watch?v=iOsixN3nTsc>
18. Solar cooker : <https://www.youtube.com/watch?v=7rYFXCciEx4>
19. Solar cooker : <http://www.sempersolaris.com/guide-solar-cookers/>
20. Wind turbine : https://www.youtube.com/watch?v=oPhNQ35_Dwo
21. Wind turbine : <https://www.youtube.com/watch?v=OzfM9NVgcjI>
22. Wind turbine : <https://www.youtube.com/watch?v=haPheNEitHQ>
23. Fuel cells: https://www.youtube.com/watch?v=_TqSU21aWoA

(c) Others:

1. Learning Packages.
2. Manufacturers' Manual

M) List of Major Laboratory Equipment and Tools:

S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
1	Flat plate Solar collector	Orientation Vertical (Portrait) Height / Width / Depth (mm) 2035 / 1233 / 80 Overall collector area (mm) 2.51 Aperture area (m ²) 2.35 Absorber area (m ²) 2.32 Weight (empty) (kg) 38	LE2.4

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S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
		Capacity (solar fluid) (l) 1.85 Solar glass transmission (%) 91 Solar radiation absorption (%) 95 Solar radiation emission (%) 5 Efficiency η_0 (%) 79.0 Efficiency coefficient a_1 (W/M ² K) 2.41 Efficiency coefficient a_2 (W/M ² K ²) 0.049 Max operating pressure (bar) 10 Stagnation temperature (°C) 210 Certification CE 0036 & Solar Keymark Absorber Sheet Aluminium Absorber plate coating Sunselect (selective) Absorber tube Copper Absorber tube joints Laser welded Frame Aluminium Extruded sides / sheet rear Glazing Safety glass (low iron), 3.2mm Rear insulation 40mm Solar fluid Water / propylene glycol Flow / return connections DN 16 (G3/4")	
2	Parabolic trough Solar collector with tracking system	Parabolic trough reflecting surface Reflectors with aluminium sheet or mirror Total Collector Area 288m ² Number of collector modules 48 Number of collectors per row 8 Number of rows 6 Area of each module 6m ² Module power 2 kW Coated receiver tubes enclosed in glass Fluid Inlet Temperature (nominal) 110 C Fluid Outlet Temperature (nominal) 220 C Tracking- Moves East-West Fixed North-South; Control system- Programmable Logic Controller (PLC) or Manual; Drive mechanism- Servo or Stepper motor, single axis.	LE2.4
3	Working models of wind mills and turbines	Readymade kits	LE3.1
4	Solar appliances like drier, cooker, lantern etc.	<ul style="list-style-type: none"> Solar Lantern: Housing material ABS, Chimney Material Acrylic, Polycarbonate or Shane, LED SMD LED, SPV Module High efficiency silicon cell based SPV module, Battery 12V-7.2Ah @ C-20 SMF lead acid battery of Absorbed Electrolyte type. Solar Fan: High speed ceiling fan, Operated by 12V DC 1.5A, RPM = 320, SIZE = 1200MM, MULTI SPEED Solar Air drier: can generate hot air with temperature ranges from 40°C to 100°C. used for removing moisture from variety of agricultural products and food items without 	LE2.2 , 2.3, 2.4 , 2.5 , 2.6 , 2.7

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S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
		causing any harmful affect <ul style="list-style-type: none">• Solar Distillation Capacity – 200 litres• Solar water pumps• Solar torches• Solar street lighting systems• Solar traffic blinker• Solar mobile charger	
5	Demonstration model of Biogas plant.		LE4.1
6	Models, Charts and videos related to non conventional sources of energy		LE 5.1 & 5.2
7	Digital Pyranometer	Response Time less than 15 seconds , Battery life : approx. 100 hr , Sensitivity : 5 to 20 μ V / W/m ² , Direction Response less than 20 W/m ² , Field of view 180 degree , Temperature response less than 5%	LE2.1
8	Fuel Cells	Hydrogen / Air Fuel Cell PEM Type Energy Conversion : 40%	LE6.1

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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 Explore the role and prospects of non-conventional energy sources.	1	2	-	-	2	3	1	1	2	2	-	-	-
CO-2 Explain construction, working and maintenance of Solar energy devices and components.	1	2	2	2	2	3	1	2	2	2	-	2	1
CO-3 Describe construction and working of Wind energy related systems and subsystems.	1	2	2	2	2	3	1	2	2	2	-	2	1
CO-4 Explain construction, working and maintenance of Biomass plants.	1	2	3	2	2	3	1	2	2	2	-	2	1
CO-5 Describe construction and working of Geothermal, OTEC, Tidal and Micro Hydel energy systems and subsystems.	1	2	2	2	2	3	1	2	2	2	-	2	1
CO-6 Explore the utility of fuel cell and hydrogen energy in various areas.	1	2	2	2	2	3	1	2	2	2	-	2	1

Legend: 1 – Low, 2 – Medium, 3 – High

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O) Course Curriculum Map:

POs & PSOs No.	COs No. & Title	SOs No.	Laboratory Instruction (P)	Classroom Instruction (L)	Self Learning (SL)
PO 1,2,5,6, 7,8,9,10	CO-1 Explore the role and prospects of non-conventional energy sources.	SO1.1 SO1.2 SO1.3	----	Unit-1.0 Energy sources 1.1,1.2,1.3,1.4,1.5, 1.6	As mentioned in page relevant pages
PO 1,2,4,5,6, 7,8,9,10 PSO 2,3	CO-2 Explain construction, working and maintenance of Solar energy devices and components.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5 SO2.6	LE2.1 , LE 2.2 LE2.3 , LE 2.4 , LE2.5 , LE 2.6 , LE 2.7	Unit-2.0 Solar energy 2.1, 2.2 ,2.3, 2.4, 2.5 ,2.6	
PO 1,2,4,5,6, 7,8,9,10 PSO 2,3	CO-3 Describe construction and working of Wind energy related systems and subsystems.	SO3.1 SO3.2 SO3.3 SO3.4	LE3.1	Unit-3.0 Wind energy 3.1, 3.2, 3.3	
PO 1,2,4,5,6, 7,8,9,10 PSO 2,3	CO-4 Explain construction, working and maintenance of Biomass plants.	SO4.1 SO4.2 SO4.3 SO4.4	LE4.1	Unit-4.0 Energy from Biomass 4.1, 4.2, 4.3	
PO 1,2,4,5,6, 7,8,9,10 PSO 2,3	CO-5 Describe construction and working of Geothermal, OTEC, Tidal and Micro Hydel energy systems and subsystems.	SO5.1 SO5.2 SO5.3 SO5.4	LE5.1 , LE5.2	Unit-5.0 Geothermal, Micro Hydel, Ocean Thermal Energy Conversion and Tidal Energy 5.1, 5.2, 5.3, 5.4	
PO 1,2,4,5,6, 7,8,9,10 PSO 2,3	CO-6 Explore the utility of fuel cell and hydrogen energy in various areas.	SO6.1 SO6.2 SO6.3	LE6.1	Unit-6.0 Fuel cells and Hydrogen Energy 6.1, 6.2	

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- A) Course Code : 200256 (37)
 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	Credit L+(P+T)/2
1	Mechanical Engineering	200256 (37)	Engineering Drawing	2	-	4	4

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	200256 (37)	Engineering Drawing	100	20	30	-	-	150

• **PROGRESSIVE ASSESSMENT: (50 MARKS)**

1. CLASSROOM ASSESSMENT (CA): (a) CLASSTEST (CT) – 20,
(b) TEACHER’S ASSESSMENT (TA) – 30 (Sessional work (SW) -20, Attendance (ATT) -10)
2. LABORATORY ASSESSMENTS (LA): NIL

• **END SEMESTER ASSESSMENT (ESE): (100 MARKS)**

1. END SEMESTER EXAM (ESE-THEORY) - 100
2. END SEMESTER EXAM (ESE-PRACTICAL) ESE - NIL

Note: i. Separate passing is must for TA component of Progressive assessment, both for theory and practical.
ii. Separate passing is must for End Semester Exam (Theory) and End Semester Exam (Practical).

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 = 12)

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.		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,	<ul style="list-style-type: none"> • Different type of drawing and instruments

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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° and 15° & 105° and 45° 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 = 16)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
SO2.1 Draw an ellipse for a given set of data.		Unit-2.0 Constructions of conic curves 2.1 Conics: Cone – 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, rectangular method and Eccentricity method when focus and directrix are given. 2.3 Parabola: Construction of parabola by rectangular method, parallelogram method and eccentricity 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.	<ul style="list-style-type: none"> • Involutés of a circle • Cycloid
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.			

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 = 20)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self Learning (SL)
<p>SO3.1 Draw the projection of points for a given set of conditions.</p> <p>SO3.2 Draw the projection of line for a given set of conditions.</p> <p>SO3.3 Draw the projection of planes for a given set of conditions.</p>		<p>Unit-3.0 Projections of points, lines and planes</p> <p>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.</p> <p>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.</p> <p>3.3 Projection of Planes:</p>	<ul style="list-style-type: none"> • Projections on auxiliary planes

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

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 cardboard/thermocole pieces and observe them by placing in different positions as specified in 3.3.
- ii. Cut a cardboard/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.

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

(Approx. Hrs: L+P+T = 22)

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.		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 isometric objects – front view/ top view/ right/ left side view. 4.3 Concept of sectioning planes , Auxilliary planes and true shape of section ,Practice problems for drawing projections and section of solids	<ul style="list-style-type: none"> 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: CI+LI+SW+SL = 18)

Session Outcomes (SOs)	Laboratory Instruction (L)	Class room Instruction (CI)	Self Learning (SL)
SO5.1 SO5.1 Draw Isometric view from orthographic views of given objects		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.	<ul style="list-style-type: none"> View video programmes related to this outcome.

Legend: L: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) 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) (includes assignment, seminar, mini project etc.), and Self Learning (SL).

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 = 24)

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.		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.	<ul style="list-style-type: none"> • 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° pressure angle using array command.

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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	3	3	8	14
II	Constructions of conics	3	3	8	14
III	Projections of point, line and planes	3	-	15	18
IV	Orthographic Projection and Section of solids	3	-	14	17
V	Isometric Projection	3	-	14	17
VI	Computer aided Drafting	3	3	14	20
Total		15	9	76	100

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

J) 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)

K) Suggested Learning Resources:

(d) 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. Jeyapooan	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=z4xZmBpXlzQ>
2. dimensioning system : <https://www.youtube.com/watch?v=OF3S6BjMKsl>
3. Basic of engineering drawing : <https://www.youtube.com/watch?v=FEju-hA5Peo>
4. Engineering scales : <https://www.youtube.com/watch?v=n9iOcuttWHAo>
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=nDmwL1IWolc>
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=ZugYdLxsgOE>
17. Nptel Web reference : <http://nptel.ac.in/courses/112103019/15>

(c) Others:

1. Learning Packages.
2. Manufacturers' Manual

L) 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	Not Required
2	CAD workstations	latest configuration	Not Required
3	Drawing boards	A1 size	Not Required
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®	Not Required

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S. No.	Name of Equipment	Broad Specifications	Relevant Experiment Number
5	Sample production/construction drawings	From nearby industries, construction companies and developed by senior teachers of the state	Not Required
6	Printer/plotter	A3 size	Not Required
7	Models for projection and demonstration	Wooden models	Not Required

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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 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

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N) 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	Not applicable	Unit-1.0 Basics of Engineering Drawing 1.1, 1.2, 1.3, 1.4, 1.5	As mentioned in page 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	Not applicable	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.	SO3.1 SO3.2 SO3.3	Not applicable	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	Not applicable	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	Not applicable	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	Not applicable	Unit-6.0 Computer aided Drafting	

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- A) Course Code : 200264 (46)
 B) Course Title : Seminar & Technical Presentation Skill Part – II
 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 focus of the course is to develop a wide variety of soft skills starting from communication, to work in different environments, developing emotional sensitivity, learning creative and critical decision making, developing awareness of how to work with and negotiate with people. The key areas addressed are conversation skills, group skills, persuasion skills, presentation skills, personal grooming, positive thinking and vocational skills.

E) Course Outcomes:

- CO-1 Exhibit impressive personality in society.
 CO-2 Explore different Leadership skills and Team work
 CO-3 Develop different skills of group discussion.

F) Scheme of Studies:

S.No	Board of Study	Course Code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Credit L+(P+T)/2
1	Humanities	200264 (46)	Seminar & Technical Presentation Skill Part–II	-	2	-	1

Legend: L-Lecture, P-Practical, T-Tutorial

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	200264 (46)	Seminar & Technical Presentation Skill Part–II	-	-	-	-	10	10

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

Note: Separate passing is must for Classroom/Lab Assessment (Theory/Practical)

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 (CI), Laboratory Instruction (LI), 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 Exhibit impressive personality in society.

Session Outcomes (SOs)	Laboratory Instruction/Classroom Instruction (LI/CI)	Self Learning (SL)
SO-1 Understand and practice positive traits for an impressive personality.	Concept and meaning of personality 1.1 Characteristics/Qualities 1.2 Factors influencing personality Need for desirable personality 1.3 Posture and Health 1.4 Good Health diet Exercise, Personal Cleanliness, Sleep and Rest 1.5 Use of Cosmetics 1.6 Dress Code 1.7 Eye-Contact	<ul style="list-style-type: none"> Motivational Movies, Videos, Lectures, Interviews, Yoga etc.,

CO-2 Explore different Leadership skills and Team work

Session Outcomes (SOs)	Laboratory Instruction/Classroom Instruction (LI/CI)	Self Learning (SL)
SO-2 Understanding Leadership & Team work	2.1 Skills for a good Leader. Different Leadership Styles Autocratic, Democratic, Ethical, Transformational, Team Leadership 2.2 Necessity of Team Work Personally, Socially, professionally and Educationally	

CO-3 Develop different skills of group discussion.

Session Outcomes (SOs)	Laboratory Instruction/Classroom Instruction (LI/CI)	Self Learning (SL)
SO-3 Participate in Group Discussion	3.1 Weighing Positives & Negatives in Group Discussion 3.2 Dos and Don'ts of Group Discussion 3.3 Initiating, continuing and concluding a Group Discussion	
SO-4 Use proper tools to manage Time in different situations.	4.1 Principles of Time Management 4.2 Criteria governing Time Management 4.3 Prioritizing work	

SW- Suggested Sessional Work (SW):

- a. **Assignments:**
Preparing skits to show Creativity, communication, critical thinking
- 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, movie clips, games, examples, story/sharing questionnaire/role play/exercises/ Task, Video/Audio recording

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

Unit Number	Unit Titles	Marks Distribution			Total Marks
		R	U	A	
I	Personal Grooming	1	-	2	3
II	Leadership & Team Work	-	1	2	3
III	Group Discussion	-	-	2	2
IV	Time Management	-	1	1	2
Total		1	2	7	10

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

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

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	How to achieve success and happiness	Beau Norton	CreateSpace Independent Publishing Platform	Latest edition
2	Living English Structure	Allen	Cambridge Publications	Fifth edition(2009)
3	The Quick and Easy Way to Effective	Dale Carnegie	Amazing Reads	23 January 2018

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	Speaking			
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
6	Covey Sean, Seven Habit of Highly Effective Teens	Covey Sean,	Fireside Publishers, 1998.	
7	How to win Friends and Influence People	Carnegie Dale,	Simon & Schuster, New York 1998.	
8	Thomas A Harris, I am ok, You are ok	Thomas A Harris	New York-Harper and Row, 1972	
9	Emotional Intelligence, Bantam Book, 2006	Daniel Coleman	Bantam Book, 2006	
10	Chanakya's 7 Secrets of Leadership	Pillai Radhakrishnan	Jaico Publishing House	ISBN: 9788184954012, 8184954018

(b) Open source software and websiteaddress:

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](http://www.languagelabsystem.com)
13. www.wordsworthelt.com

c) Others:

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

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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	Soft ware	English communication software's – Globalina, A-One Solutions, Wordsworth, Spears	All
3.	Computer tables & chairs	Depending upon the size of the Language Lab	All

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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 Exhibit impressive personality in society.	2	1	1	1	-	-	-	-	2	2	1	1
CO-2 Explore different Leadership skills and Team work	1	1	2	2	-	-	-	-	2	3	1	1
CO-3 Develop different skills of group discussion.	1	2	2	1					1	2	1	1

Legend: 1 – Low, 2 – Medium, 3 – High

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O) Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction(LI)	Classroom Instruction (CI)	Self Learning (SL)
PO1,2,3,4,9,10 PSO 1,2	CO-1 Exhibit impressive personality in society.	SO1.1	LE.1.1 LE1.2 LE1.3 LE1.4 LE1.5 LE1.6 LE1.7		
PO 1,2,3,4,9,10 PSO 1,2	CO-2 Explore different Leadership skills and Team work	SO2.1	LE2.1 LE2.2		
PO 1,2,3,4,9,10 PSO 1,2	CO-3 Develop different skills of group discussion.	SO3.1	LE3.1 LE3.2 LE3.3 LE4.1 LE4.2 LE4.3		

Legend: CI: Classroom Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial (T) and others), LI: Laboratory Instruction (Includes Practical performances in Laboratory, Workshop, field or other locations using different instructional strategies) SL: Self Learning

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