BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Sher-E-Bangla Nagar

Dhaka-1207.

4-YEAR DIPLOMA IN ENGINEERING CURRICULUM
COURSE STRUCTURE & SYLLABUS
(PROBIDHAN-2022)

CHEMICAL TECHNOLOGY
TECHNOLOGY CODE: (63)

2nd SEMESTER
(Effective from 2022-2023 Academic Sessions)

DIPLOMA IN ENGINEERING CURRICULUM

COURSE STRUCTURE

(PROBIDHAN-2022)

TECHNOLOGY NAME: CHEMICAL TECHNOLOGY (63)

(2nd SEMESTER)

Sl	Subject		Period		Credit	Marks Distribution						
						Theory Assessment			Practical Assessment			Grand Total
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	25721	Bangla -II	2	-	2	40	60	100	-	-	-	100
2	25722	English-II	2	-	2	40	60	100	-	-	-	100
3	25912	Physics -I	3	3	4	60	90	150	25	25	50	200
4	25921	Mathematics-II	3	3	4	60	90	150	25	25	50	200
5	26321	Basic Stoichiometry	2	3	3	40	60	100	25	25	50	150
6	26322	Chemical Engineering Drawing	-	6	2	-	-	-	50	50	100	100
7	26811	Basic Electronics	2	3	3	40	60	100	25	25	50	150
8	27011	Basic Workshop Practice	-	3	1	-	-	-	25	25	50	50
Total			**14**	**21**	**21**	**280**	**420**	**700**	**175**	**175**	**350**	**1,050**

বিষয় কোড	বিষয়ের নাম	টি	পি	সি
২৫৭২১	বাংলা-০২	২	০	২

উদ্দেশ্য:

বাংলা ব্যাকরণ অংশে সকল ডিপ্লোমা পর্যায়ের শিক্ষার্থীদের মধ্যে ব্যাকরণ ও ভাষা দক্ষতা বৃদ্ধির সাথে দেশপ্রেম ও মূল্যবোধকে উজ্জীবিত করবে। পঠনে ও লেখনিতে শিক্ষার্থীদের দক্ষতা অর্জন, সৃজনশীল প্রতিভার বিকাশ সাধন, সাহিত্য সংস্কৃতির প্রতি আগ্রহ সৃষ্টি এবং দৃষ্টিভঙ্গির কাঙ্খিত পরিবর্তন আনয়নে সম্যক ধারণা পাবে।

শিখনফল:

- ব্যবহারিক জীবনে ভাষা শিক্ষার প্রয়োজনীয়তার বিভিন্ন দিক বর্ণনা করতে পারবে।
- ব্যাকরণের সংজ্ঞা, পরিচয়, বিষয়বস্তু ও পরিধি সম্পর্কে অবহিত হবে।
- বাংলা সাহিত্যের যুগবিভাগ সম্পর্কে ধারণা লাভ।
- যতিচিহ্নের বহুমুখী ও ব্যাপক ব্যবহার জেনে তা প্রয়োগ করতে পারবে।
- প্রমিত বাংলা বানানের নিয়মের আলোকে বাংলা শব্দ ও বাক্য শুদ্ধভাবে প্রয়োগ করতে পারবে।
- প্রশাসনিক, দাপ্তরিক ও বিভিন্ন শিক্ষা সংশ্লিষ্ট প্রয়োজনীয় শব্দ ও পরিভাষা ব্যবহার করতে পারবে।
- চিঠিপত্র, চাকরির দরখাস্ত, প্রতিবেদন, মুঠোফোন ও ই-মেইলে যোগাযোগের জন্য বাংলা ভাষায় বার্তা ও চিঠি লিখতে পারবে।
- পাঠ্যসূচিভুক্ত এবং পাঠ্য বহির্ভূত ভাষা-সাহিত্য পাঠ করে নিজের অনুভূতি প্রকাশ করতে ও লিখতে পারবে।

	ক্লাস	নম্বর
০১। বাংলা ব্যাকরণ ও ব্যাকরণ পাঠের গুরুত্ব।	০৩	০৩
১.১ বিষয়বস্তু ও পরিধি।		
১.২ ব্যাকরণ পাঠের গুরুত্ব ও প্রয়োজনীয়তা।		
০২। বাংলা ভাষা	০৩	০৫
২.১ ভাষার সংজ্ঞা, উৎপত্তি ও ক্রমবিকাশ।		
২.২ বাংলা সাহিত্যের যুগবিভাগ।		
২.৩ বাংলা ভাষার রূপ ও রীতি।		
০৩। বাংলা ধ্বনিতত্ত্ব	০৩	১০
৩.১ ধ্বনি ও বর্ণ, উচ্চারণ স্থান ও উচ্চারণ প্রকৃতি।		
৩.২ বাংলা একাডেমি কর্তৃক প্রমিত বাংলা বানানের নিয়ম।		
৩.৩ ণ-ত্ব বিধান ও ষ-ত্ব বিধান।		
০৪। রূপতত্ত্ব	০৩	০৯
৪.১ শব্দ, শব্দের শ্রেণিবিভাগ (সংজ্ঞা, উৎপত্তি, গঠন ও অর্থ অনুযায়ী)।		
৪.২ সমার্থক শব্দ, বিপরীত শব্দ, সমোচ্চারিত ভিন্নার্থক শব্দ ও পারিভাষিক শব্দ।		
০৫। বাক্যতত্ত্ব	০৩	০৫
৫.১ বাক্য গঠন রীতি ও বাক্য প্রকরণ।		
৫.২ বাক্যান্তর।		
৫.৩ যতিচিহ্ন।		
০৬। বাক্য সংকোচন, বাগধারা, প্রবাদ প্রবচন	০৩	০৫
৬.১ বাক্য সংকোচন।		

৬.২ বাগধারা।
৬.৩ প্রবাদ-প্রবচন।

০৭। বিরচন (ভাবসম্প্রসারণ, সারাংশ/সারমর্ম) ০৩ ০৫

৭.১ ভাবসম্প্রসারণ।
৭.২ সারাংশ/সারমর্ম।

০৮। ভাষণ ও প্রতিবেদন ০৩ ০৬

৮.১ জাতীয় দিবস বিষয়ক।
৮.২ প্রাতিষ্ঠানিক ও সংবাদপত্রে প্রকাশের উপযোগী।

০৯। পত্র লিখন ০৪ ০৬

৯.১ আবেদনপত্র ।
৯.২ যোগদানপত্র ও স্মারকলিপি ।
৯.৩ সংবাদপত্রে প্রকাশ ও যোগাযোগের জন্য ই-মেইল, ক্ষুদেবার্তা ।

১০। প্রবন্ধ রচনা ০৪ ০৬

১০.১ দেশপ্রেম, মুক্তিযুদ্ধ, স্মরণীয় দিবস ।
১০.২ প্রকৃতি, শিক্ষা, খেলাধুলা ।
১০.৩ বিজ্ঞান, জীবনী ।

সহায়ক গ্রন্থ:

০১। উচ্চতর স্বনির্ভর বিশুদ্ধ ভাষা শিক্ষা - ড. হায়াৎ মামুদ

০২। ভাষা সৌরভ
ব্যাকরণ ও রচনা - মাহবুবুল আলম

০৩। বাংলা লেখার নিয়ম কানুন - হায়াৎ মামুদ

০৪। প্রমিত বাংলা বানানের নিয়ম - বাংলা একাডেমি

০৫। উচ্চ মাধ্যমিক বাংলা সংকলন - জাতীয় শিক্ষাক্রম ও পাঠ্যপুস্তক বোর্ড ।

০৬। বাংলা ব্যাকরণ ও নির্মিতি - জাতীয় শিক্ষাক্রম ও পাঠ্যপুস্তক বোর্ড ।

Subject Code	Subject Name	Period per Week		Credit
25722	English-II	T	P	C
		2	0	2

Rationale	The main objective of this syllabus is to provide ample opportunities for the students to use English for a variety of purposes in different situations. Each chapter is based on a theme that contains reading text and a range of tasks and activities, designed to enable the students to practice the different skills, sometimes individually and sometimes in pairs or groups. This syllabus has integrated grammar items into the activities allowing grammar to assume a more meaningful role in learning language. Thus the students develop their language skills by practicing language activities and not merely knowing the rules of the language.
Learning Outcomes	After the completion of the course, learners will be able to: • Develop Reading, Writing, Listening &Speaking Skills • Acquire grammatical accuracy • Develop creative writing • Communicate effectively

Unit Description:

Unit	Topics with Contents/Lesson	Skills	Class (1 Period)	Final Marks
1. People or Institutions Making History	**NELSON MANDELA, FROM APARTHEID FIGHTER TO PRESIDENT** 1.1. Talk about the world famous personality. 1.2. Know some renowned. speeches of Nelson Mandela. 1.3. Understand the meaning of confusing words. 1.4. Develop reading, speaking & listening skills. **Listening Practice (Only for contentious assessment)** **Follow the link(please play 2/3 minutes customized video):** https://www.youtube.com/watch?v=w42rHdvFpVM	Develop Reading, Writing Speaking & Listening skills	**1**	**15**

Unit	Topics with Contents/Lesson	Skills	Class (1 Period)	Final Marks
2. Human Relationships	**ETIQUETTE AND MANNERS** 2.1. Define etiquette's and manners. 2.2. Know how to behave with elders and visitors. 2.3. Learn the sources of learning etiquettes and manners. 2.4. Interpret and critically appreciate stories, short plays. https://www.youtube.com/watch?v=jPj0Z2lb8jg	Enhance Reading, Writing Speaking & Listening skills	**1**	
3. Adolescence	**ADOLESCENCE AND SOME (RELATED) PROBLEMS IN BANGLADESH** 3.1. Define adolescence. 3.2. Know the adolescence related problems in Bangladesh. 3.3.Interpret and appreciate the information critically. https://www.youtube.com/watch?v=S05PBOIdSeE	Develop Reading, Writing Speaking & Listening skills	**1**	
4. Human Rights	**AMERIGO, A STREET CHILD** 4.1. Think about the life of street children. 4.2. Know their activities. 4.3. Describe the problems that they have in their lives. 4.4. Listen for specific information on radio, television and other announcements.	Develop Reading, Writing Speaking skills	**1**	
5. Diaspora	**WHAT IS DIASPORA?** 5.1.1. Learn new vocabulary. 5.1.2. Talk about simple present to express state. 5.1.3. Identify complex and compound sentences. 5.1.4. Describe people, places and different cultures.	Strengthen Reading, Writing Speaking & Listening skills	**1**	

Unit	Topics with Contents/Lesson	Skills	Class (1 Period)	Final Marks
	https://www.youtube.com/watch?v=awPKGBzCcXY			
	'BANGLATOWN' IN EAST LONDON 5.2.1. Learn narrative sentences. 5.2.2. Make casual connection, express attitudes. 5.2.3. Learn new words and vocabulary. 5.2.4. Describe people, places and different cultures.	Develop Reading, Writing Speaking skills	**1**	
6. Peace and Conflict	**"THE OLD MAN AT THE BRIDGE" BY ERNEST HEMINGWAY** 6.1. Learn synonyms. 6.2. Apprehend text. 6.3. develop higher-order thinking ability. 6.4. Read, tell and analyze stories.	Develop Reading, Writing Speaking skills	**1**	
7. Environment and Nature	**THREATS TO TIGERS OF MANGROVE FOREST** 7.1. Prepare report on particular matter. 7.2. Write slogans for posters. 7.3. Participate in conversation, discussions and debates.	Develop Reading, Writing Speaking skills	**1**	
8. Myths and Literature	**THE LEGEND OF GAZI** 8.1. Learn myth. 8.2. Learn simple past tense. 8.3. Read, tell and analyze stories.	Enhance Reading, Writing Speaking skills	**1**	
9. Path to Higher Education	**21ST CENTURY HIGHER EDUCATION** 9.1. Know 21st century education. 9.2. Learn the factors that. Determine the nature of higher education. 9.3. Know about the entrepreneurial thinking skills. 9.4. Ask for and give opinion/suggestions.	Develop Reading, Writing Speaking & Listening skills	**1**	

Unit	Topics with Contents/Lesson	Skills	Class (1 Period)	Final Marks
10.Grammar	**USE THE RIGHT FORM OF VERBS** 10.1.1. Use the verbs in correct form maintain the tense of the verb.	Learn grammar as sub-skill	**3**	**15**
	CHANGING VOICE FROM ACTIVE TO PASSIVE & VISE-VERSA 10.2.1. Change active voice to passive and vise-versa. 10.2.2. Use voice in sentence.	Learn grammar as sub-skill	**3**	
	APPROPRIATE PREPOSITIONS 10.3.1. Learn the appropriate usage of preposition. 10.3.2. Apply the appropriate Prepositions in sentence.	Learn grammar as sub-skill	**1**	
	COMPLETING SENTENCE 10.4.1. Gather knowledge of sentence structure. 10.4.2. Develop writing skills.	Learn grammar as sub-skill	**2**	
	PUNCTUATION AND CAPITALIZATION 10.5.1.Use punctuation's and capital letters appropriately in the Sentence.	Learn grammar as sub-skill	**1**	
	SENTENCE STRUCTURE 10.6.1. Analyze different type's grammatical terms. 10.6.2. Apply sentence correctly.	Learn grammar as sub-skill	**3**	
	PHRASE 10.7.1. Use phrases in conversation.	Learn grammar as sub-skill	**1**	
11.Composition	**PROCESS WRITING** 11.1.1.Use writing elements(prewriting, drafting, Revising and editing).	Strengthen Writing & Speaking skills	**1**	**30**
	DESCRIPTIVE, NARRATIVE AND CREATIVE WRITING (SUCH AS TELLING / COMPLETING STORIES) 11.2.1. Develop speaking fluency. Develop creative writing ability.	Develop Writing & Speaking skills	**1**	

Unit	Topics with Contents/Lesson	Skills	Class (1 Period)	Final Marks
	DIALOGUE WRITING	Develop Speaking & Writing skills	**1**	
	POSTER 11.3.1. Prepare poster. 10.10.2. Describe poster.	Extend creative thinking ability, Develop presentation and speaking skills	**1**	
	REPORT WRITING 11.4.1. Write reports on newspaper and problem identification.	Develop Reading & Writing skills	**2**	
	ACADEMIC WRITING 11.5.1.Analyze graphs and charts Summary writing. 10.12.2. Extend analytical skills.	Enhance Reading & Writing ability	**2**	
		Total	**32**	**60**

Recommended Books:

SL	Book Name	Writer Name	Publisher Name & Edition
01	**English For Today** **Classes XI – XII & Alim**	Quazi Mustain Billah Fakrul Alam M Shahidullah Shamsad Mortuza Zulfeqar Haider Goutam Roy	**NATIONAL CURRICULUM AND TEXT BOOK BOARD,BANGLADESH**

Website References:

SL	Web Link	Remarks
01	https://www.youtube.com/watch?v=w42rHdvFpVM	
02	https://www.youtube.com/watch?v=jPj0Z2lb8jg	
03	https://www.youtube.com/watch?v=S05PBOIdSeE	
04	https://www.youtube.com/watch?v=awPKGBzCcXY	

Marks Distribution (100)	
Attendance	05
Class Test(Listening Test)	06
Quiz Test (Speaking)	04
Presentation and Assignment	05
Midterm	20
Final	60
Total	**100**

Assessment:

1. **Test Items: Unseen Comprehension: (No text will be borrowed from the seen comprehension given in the text book, but the given assessment criterion can be followed. Texts may be taken from contemporary journals)**

Skills	Total Marks	Test Items	Notes
Listening	**06**	**MCQ, Gap filling, Taking Notes**	Test items must be newly prepared for each test by the Question setters themselves on their own.
Speaking	**04**	Describing/narrating answering questions based on everyday familiar topics/events/situations such as family, school, home city/village, books, games and sports, movie/TV show, recent events and incidents etc.	Five to ten sentences used coherently with acceptable English with understandable pronunciation

2. **Grammar Test Items:**
   - Gap filling activities without clues
   - Cloze test without clues
   - Using preposition in sentence
   - Use of punctuation and capitalization
   - Making sentence with given structure
   - Making sentence with phrase
3. **Composition Test Items:**
   - Writing process
   - Completing an incomplete stories
   - Writing dialogue on a given situation
   - Preparing an attractive poster on a given topic and describing it
   - Preparing report on given context
   - Describing a given graph/chart (descriptive, analyzing, analytic)
   - Writing summary (given seen comprehension) with title

DIPLOMA IN ENGINEERING
DETAILED SYLLABUS
PROBIDHAN-2022

Subject Code	Subject Name	Period per Week		
		T	P	C
25912	PHYSICS-I	3	3	4

Rationale	Physics is the basic science for all engineering students as well as diploma engineering students. To develop a foundation in scientific principle and processes for the understanding and application of various technology. It will help the students to study in technical subject of diploma engineering students and it is also pre-requisite of physics- 2. This subject will cover quantities, Motion, mass, weight, force, pressure, wave, sound, velocity of sound, work, power and energy, elasticity of matter, behavior of fluids, and gas.
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to:** ➢ Describe Various types of quantities ➢ Enumerate Motion, mass, weight, force, pressure, wave, sound, velocity of sound, work, power and energy, elasticity of matter, behavior of fluids, and gas. ➢ Describe measurement of various quantities. ➢ Explain different techniques for improving the knowledge of matter.
Learning Outcome (Practical)	**After undergoing the subject, students will be able to:** • Determine the diameter and area of cross section of wire. • Measure thickness of glass plate. • Verify the law of parallelogram of forces • Determine the value of "g'' and student will can draw $L - T^2$ graph. • Calculate the Young's modulus of a steel wire. • Determine the specific gravity of solid. • Calculate the moment of inertia. • Determine unknown frequency of tuning fork.

Detailed Syllabus (Practical)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	**PHYSICAL WORLD AND MEASUREMENT** 1.1 Mention the Scope and excitement of physics. 1.2 Describe relation between Physics and other knowledge of technological world. 1.3 Describe Principle of measurement. 1.4 Relate units of Fundamental and derived quantities. 1.5 Describe the errors of measuring instrument. 1.6 Describe Slide calipers, Screw gauge and Spherometer.	**2**	**2**
2	**VECTOR QUANTITIES** 2.1 Describe vector and scalar quantities. 2.2 Prove the various representations of the vector quantities; and representation of a vector by unit vector. 2.3 Explain the resultant of two vectors in different directions. 2.4 Resolve a vector into horizontal and vertical component. 2.5 Explain the dot and cross product of two vectors. 2.6 Define laws of triangle and parallelogram of Vector. 2.7 Solve the problems related with vector.	**3**	**8**
3	**MOTION AND EQUATIONS OF MOTION** 3.1 Define rest and motion. 3.2 Mention the Classification of motion. 3.3 Explain different motion. 3.4 Deduce equations of motion. 3.5 Explain the laws of falling bodies and mention the equation of motion of a body when it is projected vertically upwards or downwards. 3.6 Solve the problems related with Motion.	**3**	**5**
4	**CIRCULAR MOTION** 4.1 Define circular motion and projectile motion. 4.2 Deduce Equation of motion of a freely moving body thrown obliquely vertically upward or motion of a projectile. 4.3 Define angular velocity and linear velocity with their units. 4.4 Deduce the relation between angular velocity and linear velocity. 4.5 Define centripetal and centrifugal force with examples.	**5**	**8**

	4.6 Prove that centrifugal force $F = \frac{mv^2}{r}$. 4.7 Define moment of inertia, torque and angular momentum. 4.8 Deduce the relation between moment of inertia, angular momentum and angular velocity. 4.9 Deduce the relation between torque and angular acceleration. 4.10 Explain the law of conservation of angular momentum. 4.11 Solve the problems related with Circular Motion.		
5	**FORCE AND FRICTION** 5.1 Define force, constant force, Variable force, conservative and non-conservative force. 5.2 State Newton's law of motion and Prove that F=ma; from Newton's second law of motion. 5.3 Describe different units of force, unit correlation and dimension of force. 5.4 Derive the resultant of parallel forces. 5.5 State and prove the principles of conservation of momentum. 5.6 Describe friction. 5.7 Define the co-efficient of static friction. 5.8 Prove that the co-efficient of static friction is equal to the tangent of angle of repose. 5.9 Mention the merits and demerits of friction. 5.10 Solve the problems related with Force and Friction.	**3**	**8**
6	**GRAVITY AND GRAVITATION** 6.1 Explain the Kepler's law. 6.2 Define gravity and gravitation. 6.3 Explain Newton's law of gravitation. 6.4 Find out the relation between acceleration due to gravity (g) and gravitational constant(G). 6.5 State acceleration due to gravity 'g' with units and dimension. 6.6 Discuss the variation of 'g' at different places. 6.7 Define mass and weight. 6.8 Mention the units and dimension of mass and weight. 6.9 Describe escape velocity. 6.10 Solve the problems related with Force and Friction.	**3**	**8**
7	**SIMPLE HARMONIC MOTION** 7.1 Describe periodic and simple harmonic motion (SHM). 7.2 Mention the characteristics of SHM. 7.3 Describe a simple pendulum.	**3**	**5**

	7.4 Define effective length, amplitude, phase, complete oscillation, period of oscillation and frequency. 7.5 State the laws of simple pendulum. 7.6 Describe Motion of simple pendulum. 7.7 Deduce the differential equation of SHM. 7.8 Solve the problems related with SHM.		
8	**WORK, POWER AND ENERGY** 8.1 Define work, power, and energy. 8.2 State the units and dimensions of work, power and energy. 8.3 Prove the principle of conservation of energy for freely falling body. 8.4 Explain potential energy (PE) and kinetic energy (KE). 8.5 Derive work energy theorem. 8.6 Deduce the equation of potential and kinetic energy. 8.7 Recognize that the useful work can be found from: Efficiency= $\frac{\text{output work}}{\text{input work}} \times 100\%$ 8.8 Solve the problems related with work, power and energy.	**5**	**8**
9	**ELASTICITY** 9.1 Define Elasticity and elastic limit. 9.2 Define perfectly elastic body and perfectly rigid body. 9.3 Explain stress and strain. 9.4 Explain the hook's law. 9.5 Describe various kinds of modulus of elasticity. 9.6 Define and explain Poisson's ratio. 9.7 Prove that the potential energy per unit volume is equal to $\frac{1}{2}$ ×stress×strain. 9.8 Solve the problems related with elasticity.	**3**	**5**
10	**SURFACE TENSION AND VISCOSITY** 10.1 Describe cohesive and adhesive force. 10.2 Discuss the molecular theory of surface tension. 10.3 Define surface tension, surface energy and angle of contact. 10.4 Explain theory of capillarity. 10.5 Define viscosity and co-efficient of viscosity. 10.6 Mention necessity of viscosity. Solve the problems related with surface tension and viscosity.	**3**	**5**
11	**PRESSURE AND CHARACTERISTICS OF PRESSURE** 11.1 Discuss density and pressure as force per unit area and state that it is measured in $\mathrm{N/m^2}$ or pascal. 11.2 Mention characteristics of liquid pressure.	**2**	**3**

	11.3 Establish the pressure at a point in a fluid depend upon the density of the fluid, the depth in the fluid and acceleration due to gravity. 11.4 Solve the problems related with pressure.		
12	**WAVE** 12.1 Explain wave and wave motion. 12.2 Mention some definition of relating waves. 12.3 Describe the principle of super position. 12.4 Mention characteristics of progressive and stationary waves. 12.5 Derive the equation of progressive wave. 12.6 Define beats. 12.7 Describe the mathematical analysis of beats. 12.8 Solve the problems related with wave.	**3**	**8**
13	**SOUND AND VELOCITY OF SOUND** 13.1 Explain sound and production of sound. 13.2 Describe that sound can be produced of different frequencies and that the human ear has an audible frequency range covering approximately 20Hz to 20KHz. 13.3 State the approximately frequency for Infrasonic sound and Ultrasonic sound. 13.4 Describe the practical uses of echo sounding devices. 13.5 Explain resonance, free vibration and forced vibration. 13.6 Derive the equation for velocity of sound, $v = f\lambda$. 13.7 Explain intensity and intensity level of sound. 13.8 Mention the effects of pressure, temperature, and humidity on the velocity of sound in air. 13.9 Solve the problems related with sound.	**4**	**6**
14	**IDEAL GAS AND KINETIC THEORY OF GASES** 14.1 Define Ideal gas. 14.2 Describe the laws of gas. 14.3 Define absolute zero temperature 14.4 Define STP or NTP. 14.5 Describe fundamental postulates of gas molecules. 14.6 Explain the kinetic theory of gas molecules. 14.7 Prove that the ideal gas equation is $PV = nRT$ 14.8 Solve the problems related with theory of gases.	**3**	**8**
15	**HUMIDITY** 15.1 Explain Humidity, Absolute Humidity, Relative Humidity and Dew point. 15.2 Derive relation between vapor pressure and air pressure. 15.3 Determine humidity by wet and dry Bulb Hygrometer. 15.4 Explain few phenomena related to hygrometry. 15.5 Solve the problems related with humidity.	**3**	**3**
	Total	**48**	**90**

Detailed Syllabus (Practical)

Unit	Topics with Contents	Class (3 Period)	Marks (Continuous)
1	**Determine accurate diameter of an object using slide calipers.** 1.1 Collect sample of an object and slide calipers. 1.2 Check and set the slide calipers. 1.3 Measure small length of any object. 1.4 Measure diameter of any small cylinder. 1.5 Calculate the volume of any spherical body. 1.6 Maintain the record of performed Job.	1	3
2	**Measure the area of cross section of a wire by using screw gauge.** 2.1 Collect sample of a wire and screw gauge. 2.2 Check and set screw gauge. 2.3 Measure diameter of any narrow wire. 2.4 Calculate cross section of any object. 2.5 Maintain the record of performed Job.	1	2
3	**Determine the thickness of a glass plate by Spherometer.** 3.1 Collect sample of a glass plate and spherometer. 3.2 Check and set screw gauge. 3.3 Level the spherometer by adjusting screw. 3.4 Measure narrow thickness of any object. 3.5 Calculate radius of curvature of lens. 3.6 Maintain the record of performed Job.	1	3
4	**Verify the law of parallelogram of forces by a force board.** 4.1 Collect a force board. 4.2 Check and set a force board. 4.3 Observe and record the direction of resultant force. 4.4 Maintain the record of performed Job.	1	2
5	**Determine the co-efficient of static friction.** 5.1 Collect necessary tools and materials. 5.2 Check and set the equipment. 5.3 Select two experimental objects. 5.4 Set the object and weight each object by using horizontal table 5.5 Prevent excessive sliding of any things on a sloped surface. 5.6 Calculate the static friction by using formula 5.7 Maintain the record of performed Job.	1	3
6	**Determine the value of "g'' by using a simple pendulum and draw $L - T^2$ graph.**	3	2

	6.1 Collect necessary tools and materials. 6.2 Check and set a simple pendulum. 6.3 Measure the acceleration of gravity different places. 6.4 Measure the weight of any bodies by knowing the value of "g''. 6.5 Calculate the Time period of any oscillated body by knowing the value of "g''. 6.6 Maintain the record of performed Job.		
7	**Determine the Young's modulus of a steel wire by Searle's apparatus or by using Vernier method.** 7.1 Collect necessary tools and materials. 7.2 Check and set Searle's apparatus using Vernier method. 7.3 Measure length of a steel wire. 7.4 Set the test specimen of a steel wire into the Searle's apparatus. 7.5 Verify elastic properties of any body. 7.6 Maintain the record of performed Job.	**2**	**3**
8	**Determine the specific gravity of solid heavier than insoluble in water by Hydrostatic balance.** 8.1 Collect necessary tools and materials 8.2 Check and set Hydrostatic balance. 8.3 Set the test specimen in hydrostatic balance. 8.4 Measure the weight of a solid particle. 8.5 Measure the weight of a solid particle keeping under water. 8.6 Measure the temperature of water by thermometer. 8.7 Calculate specific gravity of solid. 8.8 Calculate specific gravity of solid repeatedly and calculate average value. 8.9 Check and justify the accuracy various type of solid by knowing value of specific gravity. 8.10 Maintain the record of performed Job.	**2**	**2**
9	**Determine the specific gravity of liquid by specific gravity bottle.** 9.1 Collect necessary tools and materials. 9.2 Measure the weight of empty bottle. 9.3 Measure the weight of bottle with water. 9.4 5Measure the weight of bottle with specimen liquid as same amount of water 9.5 Repeat the task of 8.6 three time. 9.6 Record the data in the table of above task. 9.7 Calculate the specific gravity of liquid 9.8 Maintain the record of performed Job.	**2**	**3**
10	**Determine Velocity of sound resonance method.** Collect necessary tools and materials. 10.1 Check and set resonance air column. Fill up pipe of resonance pipe of column by water.	**2**	**2**

	10.2 Strike the resonance device on a pad. 10.3 Measure the wave length of sound. 10.4 Repeat the task of 9.5 three time. 10.5 Record the data in the table of above task. 10.6 Calculate the frequency and velocity of sound 10.7 Maintain the record of performed Job.		
	Total	**16**	**25**

Necessary Resources (Tools, equipment's):

Sl	Item Name	Quantity
1	Slide calipers	15
2	Screw gauge	15
3	Spherometer	15
4	Simple pendulum	10
5	Searle, s apparatus	5
6	Hydrostatic balance	5
7	Fly wheel	5
8	Tuning fork	10

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
1.	Higher secondary physics (First part)	Dr. Shahjahan Tapan Ishak Nurunnabi Prof. Golam Hossain Pramanik	
2.	A Text Book of properties of matter	N Subrahmanyam and Brijlal	
3.	A Text Book of Sound	N Subrahmanyam and Brijlal	

Website References:

Sl	Web Link:	Remarks
1	www.Youtube.com	Search here

Subject Code	Subject Name	Period per Week		Credit
25921	Mathematics-II	T	P	C
		3	3	4

Rationale	To be able to understand the functions. To make understand the exponential series. To provide ability to apply the knowledge of differential Calculus in solving problem like slope gradient of a curve, velocity acceleration, rate of a flow of liquid etc. To enable to apply the process of integration in solving Practical Problems like Calculation of area of a regular figure in two dimensions and volume of regular solids of different shapes.
Learning Outcome (Theoretical)	To express partial fractions, understand geometric Express meaning of $\frac{dy}{dx}$ Develop differential of integral calculus. To understand vectors in Physics.
Learning Outcome (Practical)	**To able to solve problems related to limit, differentiation, integration and vector operations.**

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	**ALGEBRA(Partial Fractions):** 1.1 Define proper and improper fractions. 1.2 Resolve into partial fraction of the following types: a) Denominator having a non-repeated linear factor. b) Denominator having a repeated linear factor. c) Denominator having a quadratic factor. d) Denominator having a combination of repeated, non-repeated and quadratic factors.	**3**	
2	**ALGEBRA (Exponential series):** 2.1 Define e. 2.2 Prove that e is finite and lies between 2 and 3. 2.3 Prove that $e^x = 1 + \frac{x}{L^1} + \frac{x^2}{L^2} + \frac{x^3}{L^3} + \frac{x^4}{L^4}$ ..... to ∞ 2.4 Solve problems of the followings types: i) $1 + \frac{1}{L^2} + \frac{1}{L^4} + \frac{1}{L^6}$ + ... to ∞ ii) $\frac{1}{L^2} + \frac{1+2}{L^3} + \frac{1+2+3}{L^4} + \frac{1+2+3+4}{L^5}$ + ... to ∞	**3**	
3	**ALGEBRA(Binomial theorem):** 3.1 State binomial expression. 3.2 Express the binomial theorem for positive, negative and fractional index. 3.3 Find the general term, middle term, equidistant term and term independent of x. 3.4 Solve the problems related to above.	**3**	

4	**DIFFERENTIAL CALCULAS (Functions and Graph of Functions):** 4.1 Define constant, variable, function, domain, range 4.2 Solve problems related to functions.	**3**	
5	**DIFFERENTIAL CALCULAS (Limit):** 5.1 Define limit and continuity of a function. 5.2 Distinguish between $\lim_{x \to a}$ f(x) and f(a). 5.3 Establish (i) $\lim_{x \to 0} \frac{\sin x}{x} = 1$ (ii) $\lim_{x \to 0} \frac{\tan x}{x} = 1$	**2**	
6	**DIFFERENTIAL CALCULAS (Differential co-efficient and differentiation):** 6.1 Prove that $\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ 6.2 Find the differential co-efficient of algebraic and trigonometrical functions from first principle.	**2**	
7	**DIFFERENTIAL CALCULAS (Apply the concept of differentiation):** 7.1 State the formulae for differentiation: (i) sum or difference (ii) product (iii) quotient (iv) function of function (v) logarithmic function 7.2 Find the differential co-efficient using the sum or difference formula, product formula and quotient formula. 7.3 Find the differential co-efficient function of function and logarithmic function.	**3**	
8	**DIFFERENTIAL CALCULAS (Geometrical meaning of $\frac{dy}{dx}$):** 8.1 Interpret $\frac{dy}{dx}$ geometrically. 8.2 Explain $\frac{dy}{dx}$ under different conditions. 8.3 Solve problems related to above.	**3**	
9	**DIFFERENTIAL CALCULAS (Use Leibnitz's theorem to solve the problems of successive differentiation):** 9.1 Find 2nd, 3rd and 4th derivatives of a function and hence find n-th derivatives. 9.2 Express Leibnitz's theorem. 9.3 Solve the problems of successive differentiation and Leibnitz's theorem.	**4**	
10	**DIFFERENTIAL CALCULAS (Partial differentiation):** 10.1 Define partial derivatives. 10.2 State formula for total differential. 10.3 State formulae for partial differentiation of implicit function and homogenous function. 10.4 State Euler's theorem on homogeneous function. 10.5 Solve the problems of partial derivatives.	**4**	

11	**INTEGRAL CALCULUS (Indefinite integrals):** 11.1 Explain the concept of integration and constant of integration. 11.2 State fundamental and standard integrals. 11.3 Write down formulae for: (i) Integration of algebraic sum. (ii) Integration of the product of a constant and a function. 11.4 Integrate by method of substitution, integrate by parts and by partial fractions. 11.5 Solve problems of indefinite integration.	**4**	
12	**INTEGRAL CALCULUS (Definite integrals):** 12.1 Explain definite integration. 12.2 Interpret geometrically the meaning of $\int_a^b f(x)\,dx$ 12.3 Solve problems of the following types: (i) $\int_0^{\pi/2} \cos^2 x\,dx$. (ii) $\int_0^1 \frac{(\sin^{-1}x)^2}{\sqrt{-x^2}}dx$	**4**	
13	**VECTOR(Vector algebra):** 13.1 Define scalar and vector. 13.2 Explain null vector, free vector, like vector, equal vector, collinear vector, unit vector, position vector, addition and subtraction of vectors, linear combination, direction cosines and direction ratios, dependent and independent vectors, scalar fields and vector field. 13.3 Prove the laws of vector algebra. 13.4 Resolve a vector in space along three mutually perpendicular directions. 13.5 Solve problems involving addition and subtraction of vectors.	**4**	
14	**VECTOR (Dot product of Vectors):** 14.1 Define dot product of Vectors. 14.2 Interpret dot product of vector geometrically. 14.3 Deduce the condition of parallelism and perpendicularity of two vectors. 14.4 Prove the distributive law of dot product of vector. 14.5 Explain the scalar triple product and vector triple product. 14.6 Solve problems involving dot product.	**4**	
15	**VECTOR (Cross product of vectors):** 15.1 Define cross product of vectors. 15.2 Interpret cross product of vector geometrically. 15.3 Deduce the condition of parallelism and perpendicularity of two vectors. 15.4 Prove the distributive law of cross product of vector. 15.5 Explain the scalar triple product and vector triple product. 15.6 Solve problems involving cross product.	**2**	
	Total	**48**	**90**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Practical:** Solve problems related to following Topics: 1. Partial fractions 2. Exponential series	**16**	**25**

	3. Functions 4. Limits 5. Differential co-efficient of Differentiation 6. Geometrical meaning of $\frac{dy}{dx}$ 7. partial differentiation 8. Indefinite Integral 9. Definite Integral 10. Vector dot & cross product		
	Total	**16**	**25**

Necessary Resources (Tools, equipment's and Machinery):

Sl	Item Name	Quantity
01	**Scale**	**1 no**
02	**Geometric Box**	**1 no**

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
1.	Companian to basic Math's	G. V. Kumbhojkar	Phadke Prakashan
2.	Vector & Tensor Analysis	Murary R Spigel	Schaum's Outline Series
3.	Vector & Tensor Analysis	Md. Abu Yousuf	Mamun Brothers
4.	Co-ordinate Geometry & Vector Analysis	Rahman & Bhattacharjee	H.L. Bhattacharjee
5.	Higher Mathematics	Md. Nurul Islam	Akkhar Patra Prakashani
6.	Mathematics for Polytechnic Students	S. P Deshpande	Pune Vidyarthi Graha Prakashan
7.	Mathematics for Polytechnic Students (Volume I)	H. K. Das	S.Chand Prakashan
8.	Engg. Math's Vol I & II	Shri Shantinarayan	S.Chand & Comp
9.	Higher Mathematics	Dr. B M Ekramul Haque	Akshar Patra Prakashani
10.	Differential & Integral Calculus	Md. Abu Yousuf	Mamun Brothers
11.	Mathematics for Polytechnic Students (Volume I)	H. K. Das	S.Chand Prakashan
12.	Higher Mathematics	Ashim Kumar Saha	Akshar Patra Prakashani
13.	Higher Mathematics	S.U Ahamed & M A Jabbar	Alpha Prakashani

Website References:

Sl	Web Link: www.youtube.com	Remarks

Subject Code	Subject Name	Period per Week		Credit
26321	Basic Stoichiometry	T	P	C
		2	3	3

Rationale	Stoichiometry is the subject of mathematical science which mainly discuss about the calculation of reactants and products in a chemical reaction. In all kind of industry (especially chemical/food/pharmaceutical industry) Engineers need to calculate the amount of raw materials required for their desired products. Stoichiometric calculation help scientist & engineers working in industry have to estimate the amount of products they will obtain from a given procedure. Students those will work in this field should acquire knowledge about conversion factors, molecular units, temperature, pressure, viscosity, concentration of mixtures and solution, PVT relations etc. Bangladesh is an economic growing country where chemical and other process industries contribute in a large scale. Skill and knowledge of Basic stoichiometry are the pre-requisite to meet the demand of existing and upcoming chemical industries. Due to these reason Basic stoichiometry subject is introduced in curriculum of Diploma in Chemical Engineering Course.
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to:** ▪ State stoichiometric dimensions and calculation. ▪ Describe temperature, pressure, volume, density, specific gravity, viscosity and their calculations. ▪ Illustrate fundamental scientific concept of molecular units. ▪ Solve problem on different type of viscosity. ▪ Calculate the composition of mixtures and solutions. ▪ Solve on PVT relations of gases.
Learning Outcome (Practical)	**After undergoing the subject, students will be able to:** ▪ Conversion of units from one system to another. ▪ Measure Temperature, Pressure, viscosity and specific gravity of solutions ▪ Practice problem solving on Molecular units. ▪ Solve problem on partial pressure, partial volume, mass%, volume%, pressure% and mole% of gases.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	**STOICHIOMETRICAL DIMENSIONS** 1.1 Define Stoichiometry. 1.2 Define Unit. 1.3 Mention the measurement unit of Mass, length, time & temperature. 1.4 Describe Metric, English & Standard International unit of measurement System. 1.5 List of fundamental units of CGS, MKS & FPS system. 1.6 List of Derived units CGS, MKS & FPS system. 1.7 List of fundamental and derived units of Standard International (SI) system.	**2**	**4**
2	**DIMENSIONAL EQUATION** 2.1 Define dimension. 2.2 Define dimensional equations. 2.3 State different system of dimensions. 2.4 Describe absolute system of dimension, gravitational system of dimension and English Engineering system of dimensions. 2.5 Mention the relations of different system of dimensions.	**3**	**4**
3	**CONVERSION FACTORS** 3.1 Define conversion factors. 3.2 List the purpose of unit conversion. 3.3 State the table of conversion factors of length, mass, volume, pressure, power and energy. 3.4 Solve the problem on Conversion of velocity from FPS system to CGS & MKS system. 3.5 Solve the problem on Conversion of density from FPS system to CGS & MKS system. 3.6 Solve the problem on Conversion of flow rate from FPS system to CGS & MKS system.	**3**	**6**
4	**DENSITY AND SPECIFIC GRAVITY** 4.1 Define density and specific gravity. 4.2 Mention units of density. 4.3 Deduce the relation between density and specific gravity. 4.4 Define measuring instrument. 4.5 Describe the specific gravity of Hydrometer & Pycnometer. 4.6 Describe API scale, ^{O}Baume scale and Twaddell scale of specific gravity. 4.7 Solve the problems related to specific gravity and density.	**3**	**6**
5	**VISCOSITY OF FLIUD** 5.1 Define viscosity. 5.2 Derived the equation of viscosity, $\mu=\frac{FL}{VA}$. 5.3 Classify viscosity. 5.4 Explain absolute viscosity, gravitational viscosity & kinematic viscosity. 5.5 Describe the measurement of viscosity. 5.6 Solve the problems related to viscosity.	**3**	**6**

6	**HEAT AND TEMPERATURE** 6.1 Define heat and temperature. 6.2 Explain systems of temperature measurement. 6.3 Describe scales of temperature. 6.4 Develop the relations of different types of temperature scale. 6.5 Explain unit of heat in CGS system, FPS system and mixed unit. 6.6 Solve the problems related to thermometry.	**3**	**6**
7	**PRESSURE AND VACUUM** 7.1 Define pressure. 7.2 State the units of pressure. 7.3 Describe atmospheric pressure, gauge pressure, absolute pressure and vacuum reading. 7.4 Explain the relations of atmospheric pressure, gauge pressure and absolute pressure. 7.5 Describe measurement of pressure by using Bourdon's tube pressure gauge. 7.6 Describe the measurement of pressure using U-tube manometer and differential manometer. 7.7 Relate among pressure, density and height ($P = h\rho g$ and $P=\omega h$). 7.8 Solve the problems related to pressure, density and height relationship.	**4**	**8**
8	**IDEAL GAS LAW, PARTIAL PRESSURE AND PARTIAL VOLUME** 8.1 State ideal and real gases. 8.2 Mention the properties of ideal and real gases. 8.3 Deduce the molar volume and molar weight of gases. 8.4 Explain Vander Waal's equation for real gases. 8.5 Define partial pressure and partial volume of gases. 8.6 Explain Dalton's law of partial pressure. 8.7 Explain Avogadro's law of partial volume. 8.7 Solve problems related to real gas, partial pressure and partial volume.	**3**	**6**
9	**MOLECULAR UNITS** 9.1 Define atomic weight and molecular weight. 9.2 Describe gram-atom, kg-atom, gm-mole and kg-mole. 9.3 State Avogadro's number. 9.4 Discuss Avogadro's hypothesis. 9.5 Describe the Standard Temperature and Pressure (STP) and Normal Temperature and Pressure (NTP). 9.6 Solve the problems related to molecular units.	**4**	**7**
10	**SOLUTIONS AND MIXTURES** 10.1 Define solution and mixtures. 10.2 Explain solubility. 10.3 Explain normality, molarity and molality. 10.4 Illustrate mass%, mole% and volume%. 10.5 Relate among mass%, mole%, pressure% and volume%. 10.6 Solve the problems related to concentration of solution and mixtures.	**4**	**7**
	Total	**32**	**60**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**SOLVE THE PROBLEM OF CONVERSION FROM ONE FORM UNIT TO ANOTHER** 1.1 Apply conversion of certain value of velocity from FPS system to CGS and MKS system. 1.2 Convert the value of density from FPS system to CGS and MKS system. 1.3 Calculate the value of flow rate from FPS system to CGS and MKS system. 1.4 Maintain the record of performed job.	**1**	**2**
2	**Measure specific gravity of water/Milk by using hydrometer/Lactometer** 2.1 Prepare gravity bottle and weighing scale. 2.2 Collect mustard oil. 2.3 Weight the empty gravity bottle. 2.4 Pour the mustard oil into the bottle. 2.5 Weight the gravity bottle with oil. 2.6 Calculate specific gravity. 2.7 Maintain the record of performed job.	**1**	**2**
3	**SOLVE PROBLEMS RELATED TO VISCOSITY** 3.1 Derive the kinematic and absolute viscosity equation. 3.2 Convert value of absolute viscosity to kinematic viscosity. 3.3 Calculate the value of kinematic viscosity to absolute viscosity. 3.4 Maintain the record of performed job.	**1**	**2**
4	**Measure viscosity by using glass viscometer/digital viscometer** 4.1 Collect Ethanol, Glycerin, Beaker, Viscometer, pipette & water. 4.2 Clean the viscometer by water and ethanol and dry it. 4.3 Put a certain amount of liquid in the large bulge viscometer and pull it by pipette until the small bulge is full. 4.4 Put viscometer vertically in the water bath at the desired temperature. 4.5 Measure the liquid to flow through the capillary tube with run time when the liquid reaches the mark shown on the viscometer and then stopped time when the liquid reaches the bottom mark. 4.6 Repeat the experiment and record the results (take average of results). 4.7 Repeat the experiment to other liquids. 4.8 Change the temperature and calculate the viscosity. 4.9 Maintain the record of performed job.	**2**	**3**
5	**MEASURE BOILING POINT OF WATER BY USING GLASS THERMOMETER** 5.1 Collect Delivery tube, thermometer, Pieces of pumice stone, Beaker, Stand with clamp, Gas burner, Rubber cork with two bores, Triple stand and distilled water.	**2**	**3**

	5.2 Take about 25ml of distilled water in a boiling tube and add 2-3 small pieces of pumice stone. 5.3 Close the mouth of the boiling tube with a rubber cork that has two bores and clamp it with the stand. 5.4 Perform reading thermometer (temperature range -10 to 110°C) in one bore of the cork of the boiling tube. Keep the bulb of the thermometer about 3-5 cm above the surface of the water. 5.5 Set one end of a delivery tube in the second bore of the cork. 5.6 Put a 250ml beaker below the second end of the delivery tube to collect the condensed water. 5.7 Heat the boiling tube gently, preferably by rotating the flame. 5.8 Note the temperature (t_1) when the water starts boiling. 5.9 Continue to heat the water till the temperature becomes constant, and the water remains boiling. Note the constant temperature (t_2). 5.10 Record your observations in tabular form.		
6	**STUDY ON PRESSURE AND PRESSURE MEASUREMENT DEVICES WITH SCHEMATIC DIAGRAM** 6.1 Draw the relationship between Atmospheric, Absolute, gauge pressure and Vacuum. 6.2 Indicate the Atmospheric pressure, Absolute pressure and Gauge pressure. 6.3 Draw the C-Type Burdon tube pressure gauge. 6.4 Indicate the different parts of the C-Type Burdon tube pressure gauge. 6.5 Open a C-type Burdon tube pressure gauge and identify each parts. 6.6 Maintain the record of performed job.	**2**	**2**
7	**SOLVE PROBLEMS ON PRESSURES, VOLUME AND TEMPERATURE (PVT)** 7.1 Derive PVT relationship equation. 7.2 Solve the mathematical problem based on given data. 7.3 Maintain the record of performed job.	**1**	**2**
8	**SOLVE PROBLEMS ON PARTIAL PRESSURE, PARTIAL VOLUME, MOLE%, VOLUME% AND MASS% OF IDEAL GASES** 8.1 Derive relationship between Mole%, Volume% & Mass% of Ideal gasses. 8.2 Calculate the mathematical problem based on given data. 8.3 Maintain the record of performed job.	**2**	**3**
9	**SOLVE THE PROBLEMS ON MOLECULAR UNITS** 9.1 Solve the atomic and molecular related mathematical problem. 9.2 Calculate STP & NTP related mathematical problem. 9.3 Maintain the record of performed job.	**2**	**3**
10	**SOLVE PROBLEMS RELATED TO CONCENTRATION OF SOLUTION** 10.1 Calculate the mass%, mole%, volume%, normality, molarity and molality of sample solution. 10.2 Maintain the record of performed job.	**2**	**3**
	Total	**16**	**25**

Necessary Resources (Tools, equipment's and Machinery):

Sl	Item Name	Quantity
01	Glass thermometer, Beaker, Burette stands with clamp, triple stand, pumice stone, Rubber cork with hole, gas burner, Oswald viscometer, digital balance, Hydrometer, Lactometer, gravity bottle and stop watch	5 set
02	Mercury, distilled water, ethanol, acetone, oil and milk	5 set
03	C-type Bourdon tube pressure gauge, adjustable wrench, screw driver and thread tape.	1 set
04	Drawing sheet, scale, pencil, eraser	1 set

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Stoichiometry	BI Bhatt & SIM Vora	Fourth Edition
02	An Introduction to Chemical Engineering	C. E Little John	
03	Basic Stoichiometry	AKM Bazlur Rashid	BTEB
04	Stoichiometry and Process Calculations	K.V. Narayanan	Second Edition
05	Introduction to Chemical Engineering Thermodynamics	J.M. Smith	Eight Edition

Website References:

Sl	Web Link
01	https://www.ebooknetworking.net/ebooks/stoichiometry-bhatt.html
02	https://www.pmu.edu/department-of-chemical-engineering/pdf/IntroductionChemicalEngineering.pdf
03	https://engbookspdf.xyz/uploads/pdf/Stoichiometry%20and%20Process%20Calculations%202nd%20Edition.pdf
04	https://books.google.com.bd/books?id=52tqCFSC0ZgC&printsec=frontcover&redir_esc=y#v=onepage&q&f=false
05	https://www.eng.uc.edu/~beaucag/Classes/ChEThermoBeaucage/J.M.%20Smith,%20Hendrick%20Van%20Ness,%20Michael%20Abbott,%20Mark%20Swihart%20-%20Introduction%20to%20Chemical%20Engineering%20Thermodynamics-McGraw-Hill%20Education%20(2018).pdf

Subject Code	Subject Name	Period per Week		Credit
26322	Chemical Engineering Drawing	T	P	C
		0	6	2

Rationale	We know that the drawing is a language of engineering. A drawing is a graphic representation of real thing. To draw something as a figure by means of lines expressing some ideas on the paper is the drawing. The purpose of the drawing is to define and specify the shape and size of a particular object by means of lines, other information's about the object, which cannot be expressed by lines, are given side by side on the drawing in a simplest and shortest way. A good type of drawing gives full information about the object in a shortest and simplest way. A drawing worked out by an engineer, having engineering ideas, for the engineering purpose, is an Engineering drawing. It is the universal graphic language of engineers, a world language, language of use and ever increasing value. It is spoken, read, and written in its own way. Machine Drawing is one of the parts of the engineering drawing pertaining to the drawing of machines. Mechanical and Chemical Engineers are mainly concerned with the machine also the Process and Instrumentation drawing. An engineer expresses his ideas of mind on the paper through the medium of drawing. A complete working drawing of a job is prepared. Therefore, it is extremely important for the engineers, designers, supervisors, draughtsman, mechanics and other workers engaged in production to have a thorough knowledge of engineering drawing. So Chemical Engineering Drawing subject is very much essential for diploma in Chemical Engineering Course.
Learning Outcome (Practical)	**After undergoing the subject, students will be able to:** ▪ Prepare Orthographic, Oblique and Isometric view ▪ Draw section and intersection ▪ Draw screw thread, coupling, key, cotter and gear ▪ Sketch duct and plant layout ▪ Sketch Boiler mountain and accessories ▪ Perform constructing of P & I diagram.

Detailed Syllabus (Practical)

Sl.	Job/Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Perform Orthographic views of an object in first angle method.** 1.1 Identify orthographic projection in first angle. 1.2 Draw an orthographic view of an object in first angle method. 1.3 Mention given dimension to the prepared orthographic drawing. 1.4 Maintain the record of performed job. 1.5 Submit the prepared drawing to the Teacher.	**2**	**3**
2	**Perform Orthographic views of an object in third angle method.** 2.1 Identify orthographic projection in third angle. 2.2 Draw an orthographic view of an object in third angle method. 2.3 Mention given dimension to the prepared orthographic drawing. 2.4 Maintain the record of performed job. 2.5 Submit the prepared drawing to the Teacher.	**1**	**2**
3	**Perform oblique views.** 3.1 Identify oblique view drawing. 3.2 Draw an oblique view of an object. 3.3 Mention given dimension to the prepared oblique drawing. 3.4 Maintain the record of performed job. 3.5 Submit the prepared drawing to the Teacher.	**2**	**3**
4	**Perform isometric views.** 4.1 Identify the isometric drawing. 4.2 Draw an isometric view of an actual object. 4.3 Mention given dimensions on isometric drawing. 4.4 Maintain the record of performed job. 4.5 Submit the prepared drawing to the Teacher.	**1**	**2**
5	**Perform isometric views.** 5.1 Draw isometric view from the orthographic views using isometric scale. 5.2 Mention given dimensions on isometric drawing. 5.3 Maintain the record of performed job. 5.4 Submit the prepared drawing to the Teacher.	**2**	**3**
6	**Construct sectional views.** 6.1 Draw sectional symbols used for different material. 6.2 Put on dimensions to the sectional drawing. 6.3 Maintain the record of performed job. 6.4 Submit the prepared drawing to the Teacher.	**1**	**2**
7	**Construct sectional views.** 7.1 Draw the full sectional drawing from the given object/machine part. 7.2 Put on dimensions to the sectional drawing. 7.3 Maintain the record of performed job. 7.4 Submit the prepared drawing to the Teacher.	**2**	**3**
8	**Perform intersection.** 8.1 Construct /Develop intersection of an object. 8.2 Draw a round pipe intersection at 90 degree angle.	**2**	**2**

	8.3 Maintain the record of performed job. 8.4 Submit the prepared drawing to the Teacher.		
9	**Draw screw threads.** 9.1 Show the nomenclature of different parts of conventional form of screw thread. 9.2 Identify forms of screw threads. 9.3 Maintain the record of performed job. 9.4 Submit the prepared drawing to the Teacher.	**2**	**2**
10	**Draw screw threads.** 10.1 Identify forms of screw threads. 10.2 Mention the form of "V" threads. 10.3 Maintain the record of performed job. 10.4 Submit the prepared drawing to the Teacher.	**2**	**3**
11	**Perform nut and bolt fastenings.** 11.1 Identify common types of fasteners. 11.2 Sketch a square and hexagonal nut. 11.3 Maintain the record of performed job. 11.4 Submit the prepared drawing to the Teacher.	**1**	**2**
12	**Perform nut and bolt fastenings.** 12.1 Draw hexagonal headed bolt and nut. 12.2 Draw different types of set screws and grub screws 12.3 Maintain the record of performed job. 12.4 Submit the prepared drawing to the Teacher.	**2**	**3**
13	**Perform screw fastening.** 13.1 Draw different types of set screws and grub screws 13.2 Maintain the record of performed job. 13.3 Submit the prepared drawing to the Teacher.	**1**	**2**
14	**Construct shaft, couplings, key, cotter and pin.** 14.1 Identify different type's couplings, keys, cotters and pin. 14.2 Draw a motor coupling of plant. 14.3 Sketch different types of keys, cotters and pin 14.4 Maintain the record of performed job. 14.5 Submit the prepared drawing to the Teacher.	**2**	**3**
15	**Construct gears** 15.1 Identify different types of gear. 15.2 Mention the nomenclature of gears. 15.3 Maintain the record of performed job 15.4 Submit the prepared drawing to the Teacher.	**1**	**2**
16	**Construct gears** 16.1 Sketch spur gear. 16.2 Maintain the record of performed job 16.3 Submit the prepared drawing to the Teacher.	**2**	**3**
17	**Construct boiler mountings and accessories** 17.1 Identify different types of boiler mountings. 17.2 Sketch safety valve and feed check valve. 17.3 Maintain the record of performed job 17.4 Submit the prepared drawing to the Teacher.	**1**	**2**
18	**Construct boiler mountings and accessories** 18.1 Sketch a main stop valve and non-return check valve. 18.2 Maintain the record of performed job	**2**	**3**

	18.3 Submit the prepared drawing to the Teacher.		
19	**Construct duct and plant layout** 19.1 Draw Line sketch of a duct. 19.2 Draw the layout of a cold storage. 19.3 Maintain the record of performed job. 19.4 Submit the prepared drawing to the Teacher.	**1**	**2**
20	**Construct P & I (Process & Instrumentation) diagram.** 20.1 Draw a P& I diagram of a Chemical plant with process symbols. 20.2 Maintain the record of performed job. 20.3 Submit the prepared drawing to the Teacher.	**2**	**3**
	Total	**32**	**50**

Necessary Resources (Tools, Equipment/Instrument & Materials):

Sl	Item Name	Quantity
01	Tee-Square	1 set
02	Set-Square: 60°,30° and 45°	1 set
03	Pencil(hard medium and soft pencil)	3 set
04	Eraser	1 set
05	Dividers	2 set
06	Bow-pencil	1 set
07	Protractor	1set
08	Scale	1set
09	French curve	1set
10	Glass paper	1set
11	Pen knife	1set
12	Handkerchief	1set
13	Drawing paper	As need
14	Drawing board	1set
15	Board pin or board clip	As need
16	Lining pen	1set
17	Bow pen	1set
18	Lettering pen	1set

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Machine Drawing	R. B. Gupta	Satya Prakashan,New Delhi,India
02	A Text Book of Engineering Drawing	Dhawan R. K.	
03	A Text Book of Machine Drawing	Dhawan R. K.	
04	Fundamentals of Engineering Drawing	French and Vierck	
05	Prathomic Engineering Drawing(বাংলা)	Hemanta kumar Battracharjee	Biswasash Book Stall, Kolkata, India

Website References:

Sl	Web Link	Remarks
01	http://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/page/155eebe8_0092_4653_907d_421dc0890e6d/aian sonkolon fff-1-100.pdf	

Subject Code	Subject Name	Period per Week		Credit
26811	BASIC ELECTRONICS	T	P	C
		2	3	3

Rationale	Electronic devices have become an important part of our day-by-day life. Now a days it is difficult for us to live without electronic device. We live in a generation that uses electronics and smart technologies. Where robots and artificial intelligence is capable of doing human works in all technological equipment with more ease and efficiency. Operation of all machines, devices and equipment are controlled by electronic device and circuits. This subject covers only such topics which will enable the diploma engineers to identify and maintenance the electronics parts and able to proper fault finding.
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to:** • Describe soldering • Determine the value of Capacitor & Resistor using numeric and color code. • Describe Semiconductor and Semiconductor Diode. • Describe Rectifier circuits • Explain Construction and characteristics of PNP and NPN Transistor. • Explain the construction and operation of Single and Multi stage amplifier
Learning Outcome (Practical)	**After undergoing the subject, students will be able to:** • Perform soldering. • Calculate values of different resistors and capacitors with the help of color code. • Check the semiconductor diode and Determine characteristics of Diode • Verify the wave-shape of half-wave and full wave rectifier circuit • Test special diodes. • Verify the bipolar junction transistor characteristics. • Determining Q-Point and gain of transistor amplifier. • Determining frequency response of single stage R-C coupled transistor amplifier.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	SOLDERING AND COLOR CODE 1.1Define soldering. 1.2List the materials of soldering. 1.3Describe the steps of soldering. 1.4Mention the properties of a good soldering joint. 1.5Describe the active and passive components used in electronic circuits. 1.6Mention the function of resistor, capacitor and inductor in electronic circuits. 1.7Describe the procedure of determining the value of Capacitor, & Resistor using numeric and color code.	3	4
2	SEMICONDUCTOR 2.1Define conductor, semiconductor and insulator. 2.2Describe semiconductor with atomic structure. 2.3Describe the effect of temperature on conductivity of Semiconductor. 2.4Classify Semiconductor. 2.5List the commonly used semiconductor 2.6Describe the formation of P-type and N-type semiconductor. 2.7Describe the charges on N-type and P-type Semiconductor 2.8Explain the majority & minority charge carriers of P-type & N-Type Semiconductor.	3	4
3	SEMICONDUCTOR DIODE 3.1Define PN junction diode 3.2Describe the formation of PN junction. 3.3Explain forward and reverse bias in PN junction. 3.4Explain the forward and reverse Voltage-Current (VI) characteristics curve of PN junction diode. 3.5Define load line, static resistance, (iii) dynamic resistance, 3.6Define forward breakdown voltage, (v) Peak inverse voltage (PIV) and (vi) Reverse break down voltage. 3.7Describe the specification of PN Junction diode.	3	4
4	SPECIAL DIODES 4.1Define Zener Diode. 4.2Describe the operation of Zener diode. 4.3Explain Volt-Ampere(VI) characteristics of Zener diode. 4.4 Describe the application of Zener diode in, voltage stabilization, meter protection and peak clipper circuits. 4.5Describe the construction, operation and application of Tunnel diode, Varactor diode,	3	4

	Schottky diode, Step-Recovery diode, PIN diode, LED, LCD, photo diode and Solar cell.		
5	**DC POWER SUPPLY** 5.1 Define dc power supply 5.2 Describe importance of dc power supply . 5.3 Compare regulated and unregulated power supply. 5.4 Describe the operation of a typical regulated dc power supply with block diagram. 5.5 Define rectifier and rectification. 5.6 Explain the operation of half wave, full wave and bridge rectifier circuit. 5.7 Determine the ripple factor, efficiency and TUF of half wave, full wave and bridge rectifier. 5.8 Explain the operation of capacitor; inductor-capacitor and pi (π) filter circuit. 5.9 Solve problem related to ripple factor, efficiency and TUF.	3	8
6	**BIPOLAR JUNCTION TRANSISTOR (BJT)** 6.1 Define Transistor. 6.2 Describe the construction of PNP and NPN Transistor. 6.3 Explain the mechanism of current flow of PNP and NPN Transistor. 6.4 State the biasing rules of BJT. 6.5 Establish the relation among Base, Emitter and Collector current ($I_E = I_C + I_B$).	2	4
7	**Transistor Characteristics** 7.1 Describe three basic transistor configuration (CB, CC, CE) circuits. 7.2 Explain the characteristics curve of CB, CC and CE transistor configurations. 7.3 Describe current amplification factor α, β and γ. 7.4 Establish the relation among α, β and γ. 7.5 Solve problem related to I_E, I_C, I_B, α, β and γ	3	4
8	**TRANSISTOR BIASING AND STABILIZATION** 8.1 Define load line, Operating point, stability and stabilization. 8.2 State the biasing rule of transistor. 8.3 Describe faithful amplification. 8.4 Describe the methods of drawing DC load line. 8.5 Explain the leakage current in CB & CE circuits. 8.6 List the factors affecting stability of Q-points. 8.7 Describe various methods of transistor biasing. 8.8 Determine the stability factor of various transistor biasing circuits. 8.9 Solve problem related to components values, Q-Points and stability factor.	4	8

9	**SINGLE STAGE TRANSISTOR AMPLIFIER** 9.1 Define amplifier and single stage amplifier. 9.2 Mention the types of amplifier. 9.3 Explain operation of transistor as amplifier with graphical demonstration. 9.4 Describe the operation of voltage divider biased CE amplifier circuit. 9.5 Explain the phase reversal of CE amplifier. 9.6 Draw DC and AC equivalent circuit of voltage divider biased CE amplifier circuit. 9.7 Determine the AC equivalent load resistance of the CE amplifier circuit. 9.8 Determine voltage and power gain of the CE amplifier circuit. 9.9 Solve problem related to voltage and power gain where β and input resistance of the transistor are given.	4	10
10	**MULTISTAGE TRANSISTOR AMPLIFIER** 10.1 Define Multi stage amplifier. 10.2 Describe role of capacitor in single stage amplifier. 10.3 Describe gain, decibel gain frequency response, half power point, 3db point and bandwidth. 10.4 Mention the advantages of dB gain. 10.5 Describe the operation of RC coupled, Transformer coupled and direct coupled multistage amplifier. 10.6 Explain the frequency response of RC coupled, Transformer coupled and direct coupled multistage amplifier. 10.7 Mention the advantages and disadvantages of RC coupled, Transformer coupled and direct coupled multistage amplifier. 10.8 Solve problem related to voltage and power gain where β and input resistance of the transistor are given.	4	10
	Total	32	60

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**Solder & de-solder of electronic components and wires to the other components and circuit boards.** 1.1. Select electronic components, wires and PCB. 1.2. Select the rating of the soldering iron suitable for the work piece. 1.3. Clean and tin both iron & work piece. 1.4. Feed new soldering materials to the tinned and	1	3

	heated joint in order to produce a correct soldering. 1.5. Check the quality of soldering. 1.6. Clean and tin iron and de-solder the joint and components. 1.7. Use solder suckers and solder braid for de-soldering. 1.8. Maintain the record of performed job.		
2	**Determine the values of different resistors, capacitors and inductor.** 2.1 Select resistors, capacitors and inductors of different values. 2.2 Identify the colors or numeric code 2.3 Determine the value of resistors, capacitor **and inductor** with tolerance. . 2.4 Maintain the record of performed job.	1	2
3	**Sketch forward and reverse characteristics curves of a semiconductor diode.** 3.1 Select meter, power supply, components and materials. 3.2 Complete circuit according to circuit diagram for forward bias. 3.3 Check all connections. 3.4 Apply different forward voltage and measure corresponding forward current. 3.5 Record results in tabular form. 3.6 Connect circuit according to circuit diagram of reverse bias. 3.7 Apply different reverse voltage and measure corresponding forward current. 3.8 Record results in tabular form. 3.9 Sketch the VI curves from collected data. 3.10 Maintain the record of performed job.	1	2
4	**Sketch waves of half-wave and full-Wave rectifier circuit** 4.1 Select meter, component, oscilloscope and materials. 4.2 Complete circuit of a half wave rectifier according to the circuit diagram. 4.3 Check the circuit before operation. 4.4 Measure the input and output voltage and observe wave shapes in the oscilloscope. 4.5 Sketch the input and output voltage wave shapes. 4.6 Maintain the record of performed job.	1	3
5	**Testing special diodes.** 5.1 Select different types of special diodes. 5.2 Set the AVO meter in the ohm scale. 5.3 Measure resistances for each of two terminals. 5.4 Determine the condition (good and bad). 5.5 Determine the different terminals.	2	2

	5.6 Maintain the record of performed job.		
6	**Identifying the type and terminals of bipolar junction transistor.** 6.1 Select PNP and NPN bipolar junction transistors. 6.2 Take AVO and manufacturer's literature of transistor. 6.3 Identify transistor terminals. 6.4 Measure base-emitter and base-collector resistance. 6.5 Determine the specifications with the help of manufacturer's literatures. 6.6 Identify PNP, NPN transistors. Base, Collector and Emitter. 6.7 Maintain the record of performed job.	2	3
7	**Determining input and output characteristics of a transistor in common emitter connection.** 7.1. Select DC power supply units, AVO meters, circuit board, components, and required materials. 7.2. Construct the circuit. 7.3. Adjust the voltage to appropriate point. 7.4. Record input and output voltage and current. 7.5. Plot the curve with recorded data. 7.6. Determine the value of β. 7.7. Maintain the record of performed job.	2	2
8	**Determine the Q- point of R-C coupled CE transistor amplifier.** 8.1. Draw the circuit diagram for the experiment. 8.2. Collect tools, equipment and materials. 8.3. Make all the connections according to the circuit diagram. 8.4. Check the connections. 8.5. Energize the circuit and record the Collector emitter voltage and collector current. 8.6. Draw the load line and locate the Q-Point on the load line. 8.7. Maintain the record of performed job.	2	3
9	**Determine the voltage gain of CE transistor amplifier.** 9.1. Draw the circuit diagram of CE transistor amplifier. 9.2. Collect required tools, equipment and materials. 9.3. Make all the connections according to the circuit diagram. 9.4. Check the connections and Q-Point. **9.5.** Energize the circuit and record the input and output voltage. **9.6.** Calculate the voltage gain. **9.7.** Maintain the record of performed job.	2	2
10	**Demonstrate the frequency response of single stage R-C coupled CE transistor amplifier.** 10.1. Draw the circuit diagram for the experiment. 10.2. Collect required tools, equipment and materials. 10.3. Make all the connections according to the circuit diagram. 10.4. Check the connections.	2	3

	10.5. Energize the circuit and record the data. 10.6. Draw the frequency response curve from the data. 10.7. Maintain the record of performed job.		
	Total	16	25

Necessary Resources (Tools, Equipment and Machinery):

Sl. No.	Item Name	Quantity
1	Soldering Iron with Stand, De-soldering gun, Third Hand , Hot air gun, Iron Sponge, AVO Meter, Flat screw driver, Philips screw driver, Cutting pliers, Nose pliers, Automatic multifunction wire stripper. Tester, Knife, Power extension board.	30 Nos
2	DC power Supply, Function generator, Oscilloscope, Analog Electronics Trainer, Power project board/ bread board, Center tap Transformer (220/12V, 2A, 5A)	10 nos
3	Diode, Resistor, Potentiometer, Inductor, Capacitor, Transistor, LED, Zener Diode, Photo Diode.Tunnel diode, Varactor diode, Schottky diode, Step-Recovery diode, PIN diode, LCD and Solar cell.	50 nos
4	Resin, Soldering lead, Soldering tip, Fixable wire, Wire Brush	as required

Recommended Books:

Sl No.	Book Name	Writer Name	Publisher Name & Edition
1	Principles Of Electronics	V. K. Mehta	S.Chand
2	Basic Electronics (Solid State)	B. L. Theraja	S. Chand

Website References:

Sl. No.	Web Link	Remarks
1	https://www.youtube.com/channel/	
2	https://youtu.be/qsWkA-5grogo	
3	https://youtu.be/eXyGIPrD5Qk	
4	https://you.be/f-WiulYIrow	

Subject Code	Subject Name	Period per Week		Credit
27011	Basic Workshop Practice	T	P	C
		0	3	1

Rationale	Diploma in engineering Student performs the manufacture of machine parts and other mechanical engineering product following the drawing & design in industry/ factory. The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of machine operation, tools selection and proper use in the field for various types of mechanical engineering product. The emphasis will be more on teaching practical aspect rather than theory.
Learning Outcome (Practical)	**At the end of the course the students will be able to:** • Apply occupational safety and health practices in the work place. • Use hand tools, equipment and machines used simple fitting and welding works. • Cut and size metals and sheets. • Perform simple fitting work. • Develop sheet metal. • Perform shielded metal arc welding (SMAW). • Perform gas welding. • Perform soldering. • Perform Resistance Welding.

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class (3 Period)	Marks (Continuous)
1	**APPLY OCCUPATIONAL SAFETY AND HEALTH IN THE WORK PLACE.** 1.1. Identify Personal Protective equipment (PPE) as per requirement. 1.2. Select and collect PPE. 1.3. Apply safety and health procedure related to fitting and welding works. 1.4. State the importance of good housekeeping/Tidy up 1.5. Maintain Record of performed task.	1	2
02	**SHAPE METALS & SHEET METALS** 2.1. Select and collect tools and equipment.	2	3

	2.2. Select and collect metals as per Job requirement (metals limited to: MS rod, MS Flat bar, Angle bar and pipes). 2.3. Perform Lay out as per drawing. 2.4. Cut metals as per lay out using hand tools and machines (cutting tools may include-hacksaw, power saw, metal cutting disk and hand shares.). 2.5. Select and collect sheet metals as per Job requirement (Sheet metal limited to: MS sheet, GI Sheet and SS sheets and pipes). 2.6. Cut Sheet metals as per lay out using hand tools and machines (cutting tools may include-hacksaw, Snips, metal cutting disk, hand shares, Sharing machine). 2.7. Clean work place and store tools and equipment's. 2.8. Maintain Record of performed task.		
03	**PERFORM FITTING WORK FOR INTERNAL & EXTERNAL THREAD.** 3.1. Hold and clamp work piece as per job requirement. 3.2. Chip and file metals as per lay out. 3.3. Perform drilling and reaming as per job requirement using hand/bench drill machine. 3.4. Cut internal thread as per instruction. 3.5. Cut external thread as per instruction. 3.6. Check the part as per instruction. 3.7. Assemble internal & external thread. 3.8. Clean work place and store tools and equipment. 3.9. Maintain Record of performed task.	**2**	**2**
04	**DEVELOP SHEET METAL AND MAKE PRODUCTS.** 4.1. Select and collect tools and equipment as per job requirement. 4.2. Perform layout as per job requirement. 4.3. Cut sheets as per lay-out. 4.4. Bend, fold and roll sheets as per job. 4.5. Seam and hem sheets as per job requirement. 4.6. Perform riveting as per job requirement. 4.7. Solder the joints as per job requirement. 4.8. Rectangular tray, Belcha, Funnel etc. 4.9. Clean work place and store tools and equipment. 4.10 Maintain Record of performed task.	**2**	**2**
05	**PERFORM SHIELDED METAL ARC WELDING (SMAW) BEAD** 5.1. Select and collect tools and equipment as per job requirement. 5.2. Prepare work piece for welding. 5.3. Select and collect appropriate electrode.	**1**	**3**

	5.4. Set welding machine (set current, electrode in the holder and connect neutral line/earthing). 5.5. Make single and multiple straight beads. 5.6. Inspect welded joint quality. 5.7. Clean work place and store tools and equipment. 5.8. Maintain Record of performed task.		
06	**PERFORM SHIELDED METAL ARC WELDING (SMAW) 1F (LAP JOINT & BUTT JOINT)** 6.1. Select and collect tools and equipment as per job requirement. 6.2. Prepare work piece for welding. 6.3. Select and collect appropriate electrode. 6.4. Set welding machine (set current, electrode in the holder and connect neutral line/earthing). 6.5. Perform 1F (lap joint) welding lap joint. 6.6. Perform 1F(Butt joint) welding. 6.7. Inspect welded joint quality. 6.8. Clean work place and store tools and equipment. 6.9. Maintain Record of performed task.	**2**	**3**
07	**PERFORM SHIELDED METAL ARC WELDING (SMAW)1F(CORNER & T- JOINT)** 7.1. Select and collect tools and equipment as per job requirement. 7.2. Prepare work piece for welding. 7.3. Select and collect appropriate electrode. 7.4. Set welding machine (set current, electrode in the holder and connect neutral line/earthing). 7.5. Perform 1F (corner joint) welding. 7.6. Perform 1F (T- joint) welding. 7.7. Inspect welded joint quality. 7.8. Clean work place and store tools and equipment. 7.9 Maintain Record of performed task.	**2**	**3**
08	**PERFORM SHIELDED METAL ARC WELDING (SMAW) 1G (BUTT JOINT).** 8.1. Select and collect tools and equipment as per job requirement. 8.2. Prepare work piece for welding. 8.3. Select and collect appropriate electrode. 8.4. Set welding machine (set current, electrode in the holder and connect neutral line/earthing). 8.5. Perform 1G welding	**1**	**2**

	8.6. Inspect welded joint quality. 8.7. Clean work place and store tools and equipment. 8.8. Maintain Record of performed task.		
09	**PERFORM GAS WELDING AND BRAZING STRAIGHT BEAD & (1F LAP JOINT).** 9.1. Select and collect tools and equipment. 9.2. Prepare work piece for welding 9.3. Select and collect appropriate filler rod. 9.4. Select and collect appropriate flux as required. 9.5. Make different flames (carburizing, neutral and oxidizing). 9.6. Make straight bead with filler metal. 9.7. Perform 1F welding (Lap joint). 9.8. Inspect welded joint quality. 9.9. Clean work place and store tools and equipment's. 9.10. Maintain Record of performed task.	**2**	**3**
10	**PERFORM RESISTANCE WELDING.** 10.1 Demonstration of resistance welding machines. 10.2 Demonstration of accessories and tools for resistance welding. 10.3 Make spot welding joints. 10.4 Inspect welded joint quality. 10.5 Follow safe working procedures during working with spot welding machine. 10.6 Clean work place and store tools and equipment's. 10.7 Maintain Record of performed task.	**1**	**2**
	Total	**16**	**25**

Necessary Resources (Machinery):

Sl	ITEM NAME	QUANTITY
01	Arc Welding Machine	10 no
02	Gas Welding Set (Oxy-Acetylene Cylinder)	04 Set
03	Resistance Welding Machine	02 no
04	Pillar / Gaze Drill Machine	02 no
05	Hand Drill Machine	04 no
06	Hand Grinding Machine	10 no
07	Pillar/ Bench Grinding Machine	04 no
08	Power Saw Machine	01 no
09	Shearing Machine	02 no
10	Bending Machine	02 no

Necessary Resources (Tools and equipment's):

Sl	ITEM NAME	QUANTITY
1	Soldering Iron	05 nos
2	Table Vise	20 nos
3	Pipe Vise	04 nos
4	Anvil	05 nos
5	Hand shield	30 nos
6	Hand gloves	40 pairs
7	Chipping hammer	20 nos
8	Ballpin hammer (0.5, 01, 1.5 lb.)	Each 05 nos
9	Ball pin hammer 2 lb.	02 nos
10	Slage hammer 5lb	02nos
11	Mallet (Soft hammer) Various size	20nos
12	Tongs	20nos
13	Wire brash	20nos
14	Flat file (smooth, rough) 8",10",12"	Each group 12nos
15	Round file (smooth, rough) 6",8",10"	Each group 4nos
16	Half round file (smooth, rough) 8",10",12"	Each group 12nos
17	Triangle file (smooth, rough) 6",8",10"	Each group 6nos
18	Steel rule, Measuring Tap	Each 1dozon
19	Wire gauge	4nos
20	Virnear calipers	04nos
21	Micrometer (0-25mm)	02nos
22	Combination Players	10nos
23	Players(nose,cutting)	Each 05nos

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
1	Basic Sheet Metal Practice	J. W. Giachino	
2	Prathomic Fitting Sikkha	Hemanta Kumar Bhattacharia	
3	Workshop Practice Manual	K. Venkata Reddy	B.S Publications.
4	Mechaniacal Workshop Practice	K.C. John	PHI.
5	Welding Principles for Engineers	Morris	
6	Metal Fabrication	Robert L. O'con	
7	Workshop Technology-1	W.A.J. Chapman	Taylor & Francis

Website References:

Sl	WEB LINK	REMARKS
01	www.youtube	