



BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Sher-E-Bangla Nagar

Dhaka-1207.

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

MECHANICAL TECHNOLOGY

TECHNOLOGY CODE: 70

3rd SEMESTER

(Effective from 2022-2023 Academic Sessions)

DIPLOMA IN ENGINEERING CURRICULUM COURSE STRUCTURE

(PROBIDHAN-2022)

TECHNOLOGY NAME: MECHANICAL TECHNOLOGY (70)

(3RD SEMESTER)

Sl. No.	Subject		Period Per Week		Credit	Marks Distribution						Grand Total
						Theory Assessment			Practical Assessment			
	Code	Name	Theory	Practical		Continuous	Final	Total	Continuous	Final	Total	
1	25811	Social Science	2	-	2	40	60	100	-	-	-	100
2	25831	Business Communication	2	-	2	40	60	100	-	-	-	100
3	25931	Mathematics-III	3	3	4	60	90	150	25	25	50	200
4	27031	Mechanical Engineering Materials	2	-	2	40	60	100	-	-	-	100
5	27032	Machine Shop Practice-II	1	6	3	20	30	50	50	50	100	150
6	27231	RAC Cycles and Components	2	3	3	40	60	100	25	25	50	150
7	28511	Computer Office Application	-	6	2	-	-	-	50	50	100	100
Total			12	12	16	240	360	600	100	100	200	800

Subject Code	Subject Name	Period per Week		Credit
		T	P	
25811	SOCIAL SCIENCE	2	0	2

Rationale	<p>Social science deals with the social, political, economic, cultural, ethical and historical aspects of society. All these aspects help to develop different subjects of social sciences- sociology, civics, political science, economics, ethics, history etc. Students can gather social skills through acquiring knowledge of these social sciences. Social science covers only such topics which will inspire diploma graduates to become good citizen and will enable them to associate an individual with other individuals in a society or workplace. The diploma graduates can gather knowledge of the basic concepts of social sciences, human endeavor in the economic system, the realities of Bangladesh economy, fundamental rights, contemporary social changes, historical background and socio-economic culture of Bangladesh. Social science helps to explain how society works, study of social science makes students an efficient citizen in a democracy. It is essential for communities and organization.</p>
Learning Outcome (Theoretical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • Discuss the importance of social sciences and relationship among social sciences • Define the basic concepts of social sciences. • Describe the rights and duties of a citizen and qualities a good citizen. • Describe state, government, law and good governance • Explain the realities of Bangladesh economy and the current problems confronting the country • Describe the role of a Diploma Engineers in economic development of Bangladesh • Explain the process of socialization, the agencies of social control and contemporary social changes in Bangladesh • Explore our motherland and its historical background in terms of liberation war • Describe the independence of Bangladesh achieved through the leadership of Bangabandhu Sheikh Mujibur Rahman • Describe culture and civilization of Bangladesh & different ethnic groups in Bangladesh • Explain the United Nations (UN) and its role in maintaining world peace.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	<p>BASIC CONCEPTS OF SOCIAL SCIENCES</p> <p>1.1. Define social science. 1.2. Explain the importance of social sciences. 1.3. Describe the relationship among Civics, Economics, Political Science, Sociology and Ethics. 1.4. Define society, socialization, nation, nationality, citizen, citizenship and Constitution. 1.5. Define commodity, utility, value, price, wealth, consumption, income, savings, investment, wages and salary.</p>	03	05
2.	<p>SOCIETY AND CITIZENSHIP</p> <p>2.1 Describe the evolutionary stages of society in sociological perspectives. 2.2 State the characteristics of society. 2.3 Describe the rights and duties of a citizen. 2.4 State the qualities of good citizen.</p>	02	04
3.	<p>STATE, GOVERNMENT, LAW AND GOOD GOVERNANCE</p> <p>3.1 Define state, government, law and good governance 3.2 Mention the elements of state. 3.3 Discuss the forms of government. 3.4 Mention the main organs of government. 3.5 Describe the functions of legislature. 3.6 Describe the functions of executive. 3.7 Describe the functions of judiciary. 3.8 Discuss the sources of law. 3.9 Discuss the role of government to establish good governance.</p>	04	08
4.	<p>SOCIALIZATION, SOCIAL CONTROL AND SOCIAL CHANGE</p> <p>4.1 Define socialization, social control and social change. 4.2 Describe the agencies of socialization. 4.3 Describe the agencies of social control. 4.4 Explain the contemporary social changes in Bangladesh.</p>	03	05

	<p>4.5 Discuss the role of information and communication technology for social changes in Bangladesh.</p> <p>4.6 Discuss the impact of social changes.</p>		
5.	<p>DEMAND, SUPPLY, UTILITY AND NATIONAL INCOME</p> <p>5.1 Define demand.</p> <p>5.2 Define supply.</p> <p>5.3 Explain the law of demand and supply.</p> <p>5.4 Draw the demand and supply curve.</p> <p>5.5 Explain the law of diminishing marginal utility.</p> <p>5.6 Define national income.</p> <p>5.7 Discuss GDP, GNP and NNP.</p> <p>5.8 State the methods of measuring national income.</p>	04	08
6.	<p>ECONOMIC AND SUSTAINABLE DEVELOPMENT OF BANGLADESH</p> <p>6.1 Define rural and urban economy.</p> <p>6.2 Mention major problems of rural and urban economy.</p> <p>6.3 Explain the reasons of migration of rural population to urban areas.</p> <p>6.4 Discuss the role of Diploma graduate in the overall socio-economic development in Bangladesh.</p> <p>6.5 Describe the importance and potential uses of natural resources for sustainable development.</p>	04	08
7.	<p>THE PARTITION OF INDIA AND THE SUBSEQUENT POLITICAL EVENTS AND THE EMERGENCE OF INDEPENDENT-SOVEREIGN BANGLADESH</p> <p>7.1 Describe Language Movement and contemporary political and social events.</p> <p>7.2 State the 6-point demands, the Agartala Conspiracy Case and the Mass Uprising in 1969.</p> <p>7.3 Discuss the Election of 1970 and aftermath.</p> <p>7.4 The Historic Liberation War in 1971 and the emergence of sovereign Bangladesh.</p> <p>7.5 Discuss the reconstruction activities of independent-sovereign Bangladesh.</p> <p>7.6 State the background of formulating the constitution of Bangladesh.</p> <p>7.7 State the salient features of Bangladesh constitution.</p>	04	08

	7.8 Discuss the fundamental rights of a citizen in the context of Bangladesh constitution. 7.9 Difference between human rights and fundamental rights.		
8.	THE BANGABANDHU AND BANGLADESH 8.1 State the biography of Bangabandhu Sheikh Mujibur Rahman. 8.2 State the historic speech of 7 March, 1971. 8.3 Describe the significance of historic speech of 7 March for independence of Bangladesh. 8.4 Describe the role of Bangabandhu Sheikh Mujibur Rahman for achieving independence of Bangladesh. 8.5 Discuss the mournful 15 August, 1975.	03	05
9.	CULTURE AND CIVILIZATION OF BANGLADESH & DIFFERENT ETHNIC GROUPS IN BANGLADESH 9.1 Define culture and civilization. 9.2 State the elements of culture and cultural lag. 9.3 Define ethnic group. 9.4 Discuss the social and cultural lifestyle of Garo, Chakma, Rakhain and Santhal. 9.5 Describe the role of archeological relics- Mahasthangarh, Paharpur and Mainamati in the socio-cultural development of Bangladesh.	03	05
10.	THE UNITED NATIONS (UN) AND WORLD PEACE 10.1 State the main organs of United Nations. 10.2 State the functions of General Assembly. 10.3 State the functions of Security Council. 10.4 State the specialized agencies of United Nations. 10.5 Discuss the role of United Nations. 10.6 Discuss the role of Bangladesh in the United Nations.	02	04
	Total	32	60

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
০১	পৌরনীতি	মোজাম্মেল হক	হাসান বুক হাউস
০২	রাষ্ট্রবিজ্ঞানের কথা	ড. এমাজউদ্দীন আহমদ	বাংলাদেশ বুক করপোরেশন লি.
০৩	সমাজবিজ্ঞান পরিচিতি	ড. মুহাম্মদ হাবিবুর রহমান	হাসান বুক হাউস
০৪	সমাজবিজ্ঞান সমীক্ষণ	ড. নাজমুল করিম	নওরোজ কিতাবিস্তান

০৫	অর্থনীতি	আনিসুর রহমান	অ্যাডর্ন পাবলিকেশনস
০৬	অর্থনীতি	মাসুম আলী	আইডিয়াল বুকস
০৭	বাংলাদেশের ইতিহাস	কে. আলী	আজিজিয়া বুক ডিপো
০৮	'Mahasthangarh', 'Paharpur', 'Mainamati'	Banglapedia	Bangladesh Asiatic Society
০৯	বাংলাদেশের ইতিহাস ১৯৪৭-১৯৭১	ড. মো: মাহবুবর রহমান	সময় প্রকাশন
১০	বাংলাদেশের অভ্যুদয়	আবুল মাল আবদুল মুহিত	সময় প্রকাশন
১১	ইতিহাস: সমাজ ও সংস্কৃতি ভাবনা	মুসা আনসারী	বাংলা একাডেমি, ঢাকা
১২	অসমাপ্ত আত্মজীবনী	শেখ মুজিবুর রহমান	দি ইউনিভার্সিটি প্রেস লি.
১৩	কারাগারের রোজনামাচা	শেখ মুজিবুর রহমান	দি ইউনিভার্সিটি প্রেস লি.

Subject Code	Subject Name	Period per Week		Credit
25841	Business Communication	T	P	C
		2	0	2

Rationale	<p>Business communication plays a vital role in modern time. Business communication the process of sharing information between employees within and outside a company. Business communication is essential for success and growth of every organization. By studying this course students will be able to acquire knowledge on communication, Communication model and feedback, Types of communication, Formal and informal communication, Report writing, Methods of communication, effective listening, Essentials of communication, Office management and developed skills on delivered effective presentation, interpersonal communication, listening, report writing and business letter.</p>
Learning Outcome	<p>After completion of this course, students will be able to</p> <ul style="list-style-type: none"> • Effective business communication. • Developing and delivering effective presentations. • Effective interpersonal communications. • Good time management. • Effective problem solving. • Acquiring Knowledge of Information and Communication Technology. • Effective business report writing.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1.	<p>Business communication.</p> <p>1.1 Define business. 1.2 Define communication. 1.3 Define business communication. 1.4 Describe the scope of business communication. 1.5 Mention the Importance of communication in modern business. 1.6 State the objectives of business communication. 1.7 State the functions of business communication. 1.8 Discuss the principles of communication. 1.9 Mention the essential elements of communication process.</p>	4	8
2.	<p>Communication model and feedback.</p> <p>2.1 Define communication model. 2.2 State the Importance of communication model. 2.3 State the basic functions of Communication model. 2.4 Mention the Limitation of communication model. 2.5 Define feedback. 2.6 State the basic principles of effective feedback. 2.7 State the essential feedback to complete communication process.</p>	3	6
3.	<p>Types of communication.</p> <p>3.1 Define channel of communication. 3.2 Mention the channel of communication. 3.3 State the different types of communication. 3.4 Distinguish between upward and downward communication. 3.5 State the merits and demerits of upward communication. 3.6 State the merits and demerits of downward communication. 3.7 Define two-way communication. 3.8 Explain- `Two-way communication is more important now a day. 3.9 State the merits and demerits of two-way communication.</p>	5	9
4.	<p>Formal and informal communication.</p> <p>4.1 Define the formal and informal communication. 4.2 Describe the advantages and disadvantages of formal communication. 4.3 Describe the advantages and disadvantages of informal communication. 4.4 Difference between formal and informal communication.</p>	2	4

5.	Methods of communication. 5.1 Define communication methods. 5.2 Discuss the various methods of communication. 5.3 Discuss the merits and demerits of oral communication. 5.4 Discuss the merits and demerits of written communication. 5.5 Difference between oral and written communication.	3	6
6.	Effective listening 6.1 Define listening. 6.2 State the different types of listening. 6.3 State the importance of listening. 6.4 Define effective listening. 6.5 Discuss the barriers to effective listening. 6.6 Discuss the way for overcoming barriers to effective listening.	3	5
7.	Essentials of communication 7.1 Discuss the essential qualities of good communication. 7.2 Discuss the barriers of communication. 7.3 Discuss the way for overcoming barriers to good communication.	2	4
8.	Report writing 8.1 Define report, business report and technical report. 8.2 State the essential features of a good report. 8.3 Mention the factors to be considered while drafting a report. 8.4 State the components of technical report. 8.5 Distinguish between a technical report and general report. 8.6 Prepare a technical report.	4	7
9.	Office management. 9.1 Define office and office work. 9.2 State the characteristics of office work. 9.3 Define filing and indexing. 9.4 Discusses the method of filing. 9.5 Discusses the method of indexing. 9.6 Distinguish between filing and indexing.	3	5
10.	Business letter, official and semiofficial letters. 10.1 Define then business letter, official and semiofficial letters. 10.2 State the Importance of business letter. 10.3 Prepare Curriculum vitae (CV), Appointment letter, joining letter, leave letter, Complain Letter and tender notice.	3	6
	Total	32	60

REFERENCE BOOK:

1. Business Communication and Report Writing-Professor Murtaza Ali
2. Business Communication-মো: খালেকুজ্জামান ও মো: মোশারফ হোসেন চৌধুরী

Subject Code	Subject Name	Period per Week		Credit
25931	Mathematics-III	T	P	C
		3	3	4

Rationale	To be able to understand the binomial expansion. To enable to calculate the areas of regular polygons, hexagons, octagon, hydraulic mean a depth (HMD) of a Channel, area occupied by water of circular Culvert. Excavation work. To provide the ability to calculate volume of regular solids like pyramid, frustum of pyramid, Prismoid, wedge and area of curved surfaces. To understand the Laplace transformation
Learning Outcome (Theoretical)	Express Binomial expansion. To able to find the area triangle, quadrilateral, parallelogram, regular polygon & circle volume of solid Shaped. Able to solve problems related to area & volume of various type of shaped.
Learning Outcome (Practical)	Able to solve problems related to area and volume of various type of shaped.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	<p>MENSURATION(Area of Triangle):</p> <p>1.1 Find the area of triangle in the form,</p> $A = \frac{\sqrt{3}}{4} a^2, a = \text{length of a side of equilateral triangle.}$ $A = \frac{c}{4} \sqrt{4a^2 - c^2}, \text{ where } a = \text{length of equal sides, } c = \text{third side.}$ $A = \sqrt{s(s-a)(s-b)(s-c)}, \text{ where } a, b, c = \text{length of the sides of a Triangle and } 2s \text{ is the perimeter of the triangle.}$ <p>1.2 Use formula in 1.1 to solve problems.</p>	4	8
2	<p>MENSURATION (Areas of quadrilateral, Parallelogram, rhombus & trapezium)</p> <p>2.1 Define quadrilateral & Parallelogram.</p> <p>2.2 Find the areas of quadrilateral when off sets are given.</p> <p>2.3 Find the areas of a parallelogram.</p> <p>2.4 Solve problems using above formulae.</p> <p>2.5 Define rhombus & trapezium.</p> <p>2.6 Find the areas of rhombus when the diagonals are given.</p> <p>2.7 Find the areas of trapezium in terms of its parallel sides and the perpendicular distance between them.</p> <p>2.8 Solve problems related to rhombus & trapezium.</p>	3	6
3	<p>MENSURATION(Finding areas of regular polygon):</p> <p>3.1 Define a regular polygon.</p> <p>3.2 Find the area of a regular polygon of n sides, when (i) The length of one side and the radius of inscribed circle are given. (ii) The length of one side and the radius of circumscribed circle are given.</p> <p>3.3 Find the area of a regular. a) Hexagon, Octagon when length of side is given.</p>	3	6

Unit	Topics with Contents	Class (1 Period)	Final Marks
	3.4 Solve problems of the following's types: A hexagonal polygon 6 m length of each side has a 20 cm width road surrounded the polygon. Find the area of the road.		
4	MENSURATION(Areas of circle, sector and segment): 4.1 Define circle, circumference, sector and segment. 4.2 Find the circumference and area of a circle when its radius is given. 4.3 Find the area of sector and segment of a circle. 4.4 Solve problems related to the above formulae.	3	6
5	MENSURATION(Area & Volume of a rectangular solid): 5.1 Define rectangular solid and a cube. 5.2 Find geometrically the volume of a rectangular solid when its length, breadth and height are given. 5.3 Find the volume and diagonal of a cube when side is given. 5.4 Solve problems with the help of 5.2 & 5.3.	3	5
6	MENSURATION(Surface area & volume of a prism): 6.1 Define a prism. 6.2 Explain the formulae for areas of curved surfaces of prism. 6.3 Explain the formulae for volume of prism when base and height are given. 6.4 Solve problems related to 6.2, 6.3	3	5
7	MENSURATION (Area & volume of Parallelepiped and cylinder): 7.1 Define a parallelepiped and a cylinder. 7.2 Explain the formulae for areas of curved surfaces of parallelepiped and cylinder. 7.3 Explain the formulae for volume of parallelepiped and cylinder when base and height are given. 7.4 Solve problems related to 7.1, 7.2, 7.3	3	5
8	MENSURATION (Surface area & volume of pyramid): 8.1 Define pyramid. 8.2 Explain the formula for areas of curved surfaces of pyramid. Explain the formula for volumes of pyramid. 8.3 Solve problems related to 8.2, 8.3	2	4
9	MENSURATION (Surface area & volume of cone and sphere): 9.1 Define cone and sphere. 9.2 Explain the formula for areas of curved surfaces of cone and sphere. 9.3 Explain the formula for volumes of cone and sphere. 9.4 Solve problems related to 9.2, 9.3	3	5
10	GEOMETRY: Conic or conic sections: 1.1 Define Conic, Focus, Directorix and Eccentricity. 1.2 Find the equations of Parabola, Ellipse and Hyperbola. 1.3 Solve problems related to Parabola, Ellipse and Hyperbola.	3	5
11	CALCULAS (Differential Equations of first order and first degree): 11.1 Define differential equation, ordinary & partial differential equation.	4	7

Unit	Topics with Contents	Class (1 Period)	Final Marks
	11.2 Define order and degree of differential equation. 11.3 Solve the differential equations of the form: Variable separable.		
12	CALCULAS (Differential Equations of first order and first degree of homogeneous equations): 12.1 Define Homogeneous equation & Homogeneous differential equation. 12.2 Define order and degree of differential equation. 12.3 Solve the differential equations of the form: Homogeneous equation.	3	5
13	CALCULAS (First order and first degree of Exact differential equations): 13.1 Define Exact differential equation. 13.2 Define integrating factor. 13.3 Solve problems related to Exact differential equations.	3	5
14	CALCULAS (First order and first degree of Linear differential equations): 14.1 Define Linear differential equation. 14.2 Define integrating factor, Bernoulli's equation. 14.3 Solve problems related to Linear differential equations.	4	8
15	CALCULAS (Laplace Transformation): 15.1 Define Laplace transformation in the form $F(S) = \int_0^{\infty} f(t)e^{-st}dt$ 15.2 Express the deduction of Laplace transformation of the following functions. (i) Constant (ii) t (iii) t^n (iv) e^{at} (v) $\sin at$ (vi) $\cos at$ (vii) $e^{at} t^n$ (viii) $e^{at} \sin bt$ (ix) $e^{at} \cos bt$ 15.3 Define inverse Laplace transformation 15.4 Solve problem related to 15.1, 15.2, 15.3	4	8
	Total	48	90

N.B. Marks allotted per chapter above may be rearranged if necessary.

Detailed Syllabus (Practical)

SL	Experiment name with procedure	Class (3 Period)	Continuous Marks
01	Find out the area of triangle	1	2
02	Find out the areas of quadrilateral, parallelogram, rhombus & trapezium	2	3
03	Calculate the areas of regular polygon	1	2
04	Calculate the areas of circle, sector and segment	2	3
05	Find out the area & volume of a rectangular solid	1	2
06	Calculate the surface area & volume of a prism	2	3
07	Find out the area & volume of cylinder	1	2
08	Calculate the surface area & volume of pyramid	2	2
09	Find out the surface area & volume of cone and sphere	1	2
10	Solve the problems related to conic sections & differential equation	3	4

SL	Experiment name with procedure	Class (3 Period)	Continuous Marks
01	Find out the area of triangle	1	2
02	Find out the areas of quadrilateral, parallelogram, rhombus & trapezium	2	3
03	Calculate the areas of regular polygon	1	2
04	Calculate the areas of circle, sector and segment	2	3
05	Find out the area & volume of a rectangular solid	1	2
06	Calculate the surface area & volume of a prism	2	3
07	Find out the area & volume of cylinder	1	2
08	Calculate the surface area & volume of pyramid	2	2
09	Find out the surface area & volume of cone and sphere	1	2
10	Solve the problems related to conic sections & differential equation	3	4
	Total	16	25

N.B. Marks allotted per chapter above may be rearranged if necessary.

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.	Companion to basic Maths	G. V. Kumbhojkar	Phadke Prakashan
2.	Co-ordinate Geometry & Vector Analysis	Rahman & Bhattacharjee	H.L. Bhattacharjee
3.	Higher Mathematics	Md. Nurul Islam	Akkhar Patra Prakashani
4.	Mathematics for Polytechnic Students	S. P Deshpande	Pune Vidyarthi Graha Prakashan
5.	Mathematics for Polytechnic Students (Volume I)	H. K. Das	S.Chand Prakashan
6.	Engg.Maths Vol I & II	Shri Shantinarayan	S.Chand & Comp
7.	Higher Mathematics	Dr. B M Ekramul Haque	Akshar Patra Prakashani
8.	Differential & Integral Calculus	Md. Abu Yousuf	Mamun Brothers

Website References:

SL	Web Link: www.youtube.com	Remarks
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Subject Code	Subject Name	Period/Week		Credit
		T	P	C
27031	MECHANICAL ENGINEERING MATERIALS	2	0	2

Rationale	Diploma in Engineering Level students are required to acquire the knowledge, skill and attitude on concept of various mechanical materials, such as construction field in mechanical works. By the completion of this course student will be able to know different types of materials properties. As such the knowledge of mechanical engineering materials will be helpful to pre-requisite these fields for effective discharge of their duties. The subject covers only such topics which will enable the diploma engineers to ferrous, non-ferrous materials and alloys, fundamental concept of aluminum, sand, cement, sound absorbing and heat insulating materials, glass and ceramics, paints and varnishes, fire and water proofing materials, plastic materials composite materials, conducting magnetic materials and optical fiber. Engineering materials always continue to play a significant role in the current and upcoming future world. These are the necessities of the subject, mechanical engineering materials in the curriculum of Diploma in Engineering level.
Learning Outcome (Theoretical)	<p>After Completing the subject, students will be able to:</p> <ul style="list-style-type: none"> ▪ Mention the various types of Materials used in Mechanical works. ▪ State Materials used for Construction in Engineering Field. ▪ Explain the ferrous and non-ferrous Materials used in various Mechanical Field. ▪ Describe the Characteristics of Various Mechanical Engineering Materials. ▪ Explain the Color Code used in Engineering Field. ▪ Mention the uses of optical fiber in Engineering Field. ▪ Describe Various Composite Materials.

Detailed Syllabus (Theory)

Unit	Topics with contents	Period	Marks
1.	<p>BASIC OF MECHANICAL ENGINEERING MATERIALS</p> <p>1.1 Define Mechanical engineering materials. 1.2 Classify the Mechanical engineering materials. 1.3 List the Mechanical engineering materials. 1.4 Mention the characteristics of Mechanical engineering materials. 1.5 State the properties of aluminum. 1.6 Mention the uses of aluminum.</p>	3	6
2	<p>METALS AND ALLOYS</p> <p>2.1 Define ferrous and non-ferrous metals. 2.2 Define alloys. 2.3 Mention different types of metals. 2.4 List ferrous and non-ferrous metals used in industry. 2.5 Define mild steel and cast iron. 2.6 Describe the types of alloys. 2.7 State the use of steel. 2.8 Describe the use of non-ferrous metals. 2.9 Mention the uses of copper, zinc, tin, lead, brass and bronze.</p>	4	8

3	<p>SAND AND CEMENT</p> <p>3.1 Define Sand and Cement. 3.2 Mention the classification of sand according to sources. 3.3 Point out the specifications of good sand. 3.4 Describe the purpose of grading of sand. 3.5 Mention the uses of various grades of sand. 3.6 Classify the types of cement. 3.7 List the ingredients of cement. 3.8 Explain wet process and dry process of manufacturing Portland cement. 3.9 Mention the uses of cement as mechanical engineering material.</p>	4	8
4	<p>SOUND ABSORBING AND HEAT INSULATING MATERIALS</p> <p>4.1 Mention the functions of insulating materials. 4.2 State five natural heat insulating materials. 4.3 Mention the synthetic insulating materials. 4.4 Describe the sources of rubber, cork and ebonite. 4.5 Describe the uses of asbestos as insulating material. 4.6 List natural and artificial sound absorbing materials. 4.7 Explain light weight concrete used in acoustic works.</p>	3	6
5	<p>GLASS AND CERAMICS</p> <p>5.1 Define Glass. 5.2 Mention the constituents of glass. 5.3 State properties of glass. 5.4 Describe the uses of glass. 5.5 Define Ceramic. 5.6 Mention the constituents of ceramics. 5.7 Classify ceramics. 5.8 Mention the properties of ceramics. 5.9 State the uses of ceramics.</p>	4	7
6	<p>PAINTS AND VARNISHES</p> <p>6.1 Define paints and varnish. 6.2 Classify Paints. 6.3 Classify varnish. 6.4 Mention the characteristics of paint. 6.5 Point out the characteristics of varnish. 6.6 Describe color code. 6.7 Mention the use of different types paint. 6.8 List the uses of different types varnish.</p>	2	4
7	<p>FIRE AND WATER PROOFING MATERIALS</p> <p>7.1 State fire proofing materials and water proofing materials. 7.2 Mention the use of fire and waterproof materials. 7.3 Define refractory materials. 7.4 Outline the characteristics of refractory materials. 7.5 Mention the use of refractory materials.</p>	3	5
8	<p>PLASTIC</p> <p>8.1 Define plastic. 8.2 List the raw materials of plastic.</p>	3	6

	8.3 Classify different types of plastic. 8.4 Mention the types of plastic molding. 8.5 Explain the use of plastic as engineering material.		
9	COMPOSITE MATERIALS 9.1 Define composite materials. 9.2 List the composite materials. 9.3 State classification of composite materials. 9.4 Describe the application of composite materials.	2	4
10	MAGNETIC MATERIALS AND OPTICAL FIBER 10.1 Define Magnetic Materials. 10.2 Classify Magnetic Materials. 10.3 State conducting, non-conducting and semi-conducting materials. 10.4 Describe the use of semi-conducting materials. 10.5 Explain the use of magnet in industrial field. 10.6 Define Optical Fiber. 10.7 Mention the uses of optical fiber.	4	6
	Total	32	60

Subject Code	Subject Name	Period per week		Credit
27031	MACHINE SHOP PRACTICE-II	T	P	C
		1	6	3

Rationale	<p>This subject acquaints practical and working knowledge of Machine Tools and operations. The students of Diploma in engineering perform the operation on shaper, planer, milling and Computerized Numerical Control (CNC) machine to develop machining skills.</p> <p>The subject covers not only such topics but also help the diploma engineers to identify and classify the different types of machine operation, tools as well as their selection and proper use in the field for various types of mechanical engineering product. The emphasis will be given more on teaching practical aspect rather than theory.</p>
Learning Outcome (Theoretical)	<p>After completing this course, the student will be able to</p> <ul style="list-style-type: none"> ▪ State lathe machine ▪ Describe different types of thread and its parameter ▪ Illustrate of shaper machine ▪ Describe the quick return mechanism, ram stroke length and cutting speed adjustments ▪ Illustrate of planer machine. ▪ Distinguish between shaper and planer machine. ▪ Illustrate of milling machine. ▪ Describe the methods of indexing ▪ Illustrate of Computerized Numerical Control (CNC) lathe ▪ Explain the axis of motion ▪ Describe the features on CNC control panel
Learning Outcome (Practical)	<p>At the end of the course the students will be able to</p> <ul style="list-style-type: none"> ▪ Perform bush on lathe machine ▪ Perform paper weight on lathe machine ▪ Perform ball pin hammer on lathe machine ▪ Perform external single-start 'V' threads on lathe machine ▪ Perform internal single-start 'V' threads on lathe machine ▪ Perform external multi-start 'V' threads on lathe machine ▪ Perform straight slot on shaper machine ▪ Perform V-Block on shaper machine ▪ Perform hexagonal on milling machine ▪ Perform spur gear ▪ Perform rack ▪ Perform machine maintenance (Lathe, Shaper, Planer and Milling) ▪ Perform basic CNC operation

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1 Period)	Final Marks
1.	<p>LATHE MACHINE</p> <p>1.1 Explain the single and multi-start threads</p> <p>1.2 Distinguish between single and multi-start threads</p> <p>1.3 Explain internal and external threads</p> <p>1.4 Mention the parameter of threads</p> <p>1.5 List the Problems on thread cutting</p> <p>1.6 Describe the lathe chucks</p> <p>1.7 Mention the functions of lathe chuck</p> <p>1.8 Discuss the different types of attachment</p> <p>1.9 Mention the functions of lathe attachments</p> <p>1.10 Mention the Specification of center lathe according to Size</p>	2	4
2	<p>SHAPER MACHINE</p> <p>2.1 Define shaper machine</p> <p>2.2 Classify shaper machines</p> <p>2.3 Describe different components of shaper machine</p> <p>2.4 Mention the functions of shaper machine</p> <p>2.5 Describe the quick return mechanism, ram stroke length and cutting speed adjustments</p> <p>2.6 Mention Setting technique of a work piece on the machine table of shaper</p> <p>2.7 Describe typical operations for shaper machine</p> <p>2.8 Mention the Specification of shaper machine</p>	2	4
3	<p>PLANER MACHINE</p> <p>3.1 Define planer machine</p> <p>3.2 Classify planer machines</p> <p>3.3 Mention major components of planer machine</p> <p>3.4 Explain how to set a work piece on the machine table of planer</p> <p>3.5 Discuss typical operations for planer machine</p> <p>3.6 Distinguish between shaper and planer machine</p> <p>3.7 Mention specification of shaper machine</p>	2	4
4	<p>MILLING MACHINE</p> <p>4.1 Define milling machine</p> <p>4.2 Mention the types of milling machines</p> <p>4.3 List the main parts of milling machine</p> <p>4.4 Distinguish among plain, universal and vertical milling machine</p> <p>4.5 Mention the main attachments used in milling machine</p> <p>4.6 Mention the various types of milling cutter and its maintenance</p> <p>4.7 Calculate cutting speed, depth of cut, feed and width of cut for milling operation of different metals/non-metals</p> <p>4.8 Define indexing.</p>	7	12

	4.9 Describe the methods of indexing such as simple, compound, differential and angular operations 4.10 Solve the problems related on milling machine		
5	BASIC CNC MACHINE 5.1. Define CNC machine. 5.2. Describe CNC lathe machine. 5.3. State different types of CNC machine. 5.4. Distinguish between NC and CNC. 5.5. Explain the axis of motion. 5.6. Mention the features on CNC control panel. 5.7. Explain typical work offset and tool offset setup. 5.8. List the Advantages and disadvantages of CNC machines.	3	6
		16	30

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Total Marks
1	SETUP IRREGULAR WORK PIECE ON FACE PLATE 1.1 Follow OSH practices 1.2 Interpret drawing as per job specification 1.3 Select and collect tools and equipment as per job requirements 1.4 Mounting face plate on lathe main spindle 1.5 Setup irregular work piece 1.6 Setup cutting tool as required 1.7 Perform facing & turning 1.8 Check and measure work piece 1.9 Clean and store tools and equipment 1.10 Maintain the record of performed task	1	1
2	SETUP WORK PIECE ON FOUR JAW CHUCK 2.1 Follow OSH practices 2.2 Interpret drawing as per specification 2.3 Select and collect tools and equipment as per job requirements 2.4 Mounting four jaw chuck on lathe main spindle 2.5 Setup work piece 2.6 Setup cutting tool as required 2.7 Perform facing & turning 2.8 Check/ measure work piece 2.9 Clean and store tools and equipment 2.10 Maintain the record of performed task	1	1
3	MAKE A BUSH 3.1 Follow OSH practices 3.2 Interpret drawing as per specification 3.3 Select and collect tools and equipment as per job requirements 3.4 Setup work piece	2	3

	<p>3.5 Setup cutting tool as required</p> <p>3.6 Make a bush</p> <p>3.7 Check/ measure work piece</p> <p>3.8 Clean and store tools and equipment</p> <p>3.9 Maintain the record of performed task</p>		
4	<p>MAKE A PAPER WEIGHT</p> <p>4.1 Follow OSH practices</p> <p>4.2 Interpret drawing as per specification</p> <p>4.3 Select and collect tools and equipment as per job requirements</p> <p>4.4 Setup work piece</p> <p>4.5 Setup cutting tool as required</p> <p>4.6 Make a paper weight</p> <p>4.7 Check/ measure work piece</p> <p>4.8 Clean and store tools and equipment</p> <p>4.9 Maintain the record of performed task</p>	2	3
5	<p>MAKE A BALL PIN HAMMER</p> <p>5.1 Follow OSH practices</p> <p>5.2 Interpret drawing as per specification</p> <p>5.3 Select and collect tools and equipment as per job requirements</p> <p>5.4 Setup work piece</p> <p>5.5 Setup cutting tool as required</p> <p>5.6 Make a ball pin hammer</p> <p>5.7 Check/ measure work piece</p> <p>5.8 Clean and store tools and equipment</p> <p>5.9 Maintain the record of performed task</p>	2	3
6	<p>PERFORM EXTERNAL SINGLE-START 'V' THREAD</p> <p>6.1 Follow OSH practices</p> <p>6.2 Interpret drawing as per specification</p> <p>6.3 Select and collect tools and equipment as per job requirements</p> <p>6.4 Calculate data as per job requirement</p> <p>6.5 Setup work piece</p> <p>6.6 Setup gear arrangement to follow the machine chart</p> <p>6.7 Perform external single-start '1V' threads</p> <p>6.8 Check/ measure work piece</p> <p>6.9 Clean and store tools and equipment</p> <p>6.10 Maintain the record of performed task</p>	2	3
7	<p>PERFORM INTERNAL SINGLE-START 'V' THREAD</p> <p>7.1 Follow OSH practices</p> <p>7.2 Interpret drawing as per specification</p> <p>7.3 Select and collect tools and equipment as per job requirements</p> <p>7.4 Calculate data as per job requirement</p> <p>7.5 Setup work piece</p> <p>7.6 Setup gear arrangement</p> <p>7.7 Perform internal single-start 'V' threads</p> <p>7.8 Check/ measure work piece</p> <p>7.9 Clean and store tools and equipment</p> <p>7.10 Maintain the record of performed task</p>	2	3
8	<p>PERFORM EXTERNAL MULTI-START THREAD</p>	2	3

	8.1 Follow OSH practices 8.2 Interpret drawing as per specification 8.3 Select and collect tools and equipment as per job requirements 8.4 Calculate data as per job requirement 8.5 Setup work piece 8.6 Setup gear arrangement 8.7 Perform external multi-start 'V' threads 8.8 Check/ measure work piece 8.9 Clean and store tools and equipment 8.10 Maintain the record of performed task		
9	PERFORM SQUARE BLOCK ON SHAPPER MACHINE 9.1 Follow OSH practices 9.2 Interpret drawing as per specification 9.3 Select and collect tools and equipment as per job requirements 9.4 Setup work piece 9.5 Mount cutting tool 9.6 Perform facing 9.7 Perform square block 9.8 Check/ measure work piece 9.9 Clean and store tools and equipment 9.10 Maintain the record of performed task	1	2
10	PERFORM STRAIGHT SLOT CUTTING ON SHAPPER MACHINE 10.1 Follow OSH practices 10.2 Interpret drawing as per specification 10.3 Select and collect tools and equipment as per job requirements 10.4 Setup work piece 10.5 Perform facing 10.6 Perform straight slot 10.7 Check/ measure work piece 10.8 Clean and store tools and equipment 10.9 Maintain the record of performed task	1	2
11	MAKE A V-BLOCK ON SHAPPER MACHINE 11.1 Follow OSH practices 11.2 Interpret drawing as per specification 11.3 Select and collect tools and equipment as per job requirements 11.4 Calculate data as per job requirement 11.5 Setup work piece 11.6 Perform V-Block 11.7 Check/ measure work piece 11.8 Clean and store tools and equipment 11.9 Maintain the record of performed task	2	3
12	PERFORM FACING ON PLANNER MACHINE 12.1 Follow OSH practices 12.2 Interpret drawing as per specification 12.3 Select and collect tools and equipment as per job requirements 12.4 Setup work piece 12.5 Perform facing	1	2

	<p>12.6 Check/ measure work piece</p> <p>12.7 Clean and store tools and equipment</p> <p>12.8 Maintain the record of performed task</p>		
13	<p>PERFORM FACING ON MILLING MACHINE</p> <p>13.1 Follow OSH practices</p> <p>13.2 Interpret drawing as per specification</p> <p>13.3 Select and collect tools and equipment as per job requirements</p> <p>13.4 Setup work piece</p> <p>13.5 Perform facing</p> <p>13.6 Check/ measure work piece</p> <p>13.7 Clean and store tools and equipment</p> <p>13.8 Maintain the record of performed task</p>	1	2
14	<p>PERFORM STRAIGHT SOLT ON MILLING MACHINE</p> <p>14.1 Follow OSH practices</p> <p>14.2 Interpret drawing as per specification</p> <p>14.3 Select and collect tools and equipment as per job requirements</p> <p>14.4 Setup work piece</p> <p>14.5 Perform facing</p> <p>14.6 Perform straight slot</p> <p>14.7 Check/ measure work piece</p> <p>14.8 Clean and store tools and equipment</p> <p>14.9 Maintain the record of performed task</p>	1	2
15	<p>PERFORM T-SOLT CUTTING ON MILLING MACHINE</p> <p>15.1 Follow OSH practices</p> <p>15.2 Interpret drawing as per specification</p> <p>15.3 Select and collect tools and equipment as per job requirements</p> <p>15.4 Setup work piece</p> <p>15.5 Perform T-Slot</p> <p>15.6 Check/ measure work piece</p> <p>15.7 Clean and store tools and equipment</p> <p>15.8 Maintain the record of performed task</p>	2	3
16	<p>PERFORM HEXAGONAL ON MILLING MACHINE</p> <p>16.1 Follow OSH practices</p> <p>16.2 Interpret drawing as per specification</p> <p>16.3 Select and collect tools and equipment as per job requirements</p> <p>16.4 Calculate data as per job requirement</p> <p>16.5 Setup work piece</p> <p>16.6 Perform hexagonal</p> <p>16.7 Check/ measure work piece</p> <p>16.8 Clean and store tools and equipment</p> <p>16.9 Maintain the record of performed task</p>	2	3
17	<p>MAKE A SPUR GEAR</p> <p>17.1 Follow OSH practices</p> <p>17.2 Interpret drawing as per specification</p> <p>17.3 Select and collect tools and equipment as per job requirements</p> <p>17.4 Calculate data as per job requirement</p> <p>17.5 Setup work piece</p> <p>17.6 Make spur gear</p>	2	4

	17.7 Check/ measure work piece 17.8 Clean and store tools and equipment 17.9 Maintain the record of performed task		
18	MAKE A RACK 18.1 Follow OSH practices 18.2 Interpret drawing as per specification 18.3 Select and collect tools and equipment as per job requirements 18.4 Calculate data as per job requirement 18.5 Setup work piece 18.6 Make rack 18.7 Check/ measure work piece 18.8 Clean and store tools and equipment 18.9 Maintain the record of performed task	2	3
19	PERFORM MACHINE MAINTENANCE 19.1 Follow OSH practices 19.2 Produce routine maintenance schedule 19.3 Check lubricant 19.4 Detect trouble 19.5 Perform lathe maintenance 19.6 Perform shaper maintenance 19.7 Perform milling maintenance 19.8 Check adjustment 19.9 Clean and store tools and equipment 19.10 Maintain the record of performed task	1	2
20	PERFORM BASIC CNC LATHE OPERATION 20.1 Follow OSH practices 20.2 Check machine connection before starting 20.3 Start Power ON 20.4 Demonstrate control panel 20.5 Mount cutting tool and hold work piece 20.6 Perform machine axis zero 20.7 Perform work & tool offset 20.8 Perform demo program run 20.9 Perform part program run on particular job 20.10 Clean and store tools and equipment 20.11 Maintain the record of performed task	2	2
	Total	32	50

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

SI	Item Name	Quantity
01	Lathe Machine (Turret and Capstan) with accessories	10 no's
02	Shaper Machine with accessories	05 no's
03	Planer Machine with accessories	01 no.
04	Universal / Horizontal / Vertical Milling Machine with accessories	05 no's
05	CNC Lathe Center with accessories	05 no's
06	Laptop/ Desktop	01 no.
07	Multimedia Projector/ Smart board	01 no.
08	Projector screen / Display screen	01 no.

Recommended Software:

SI	Name	Quantity
01	https://swansoftcn simulator.com	As Necessary
02	https://virtlabs.tech/lathe-machine-simulator	As Necessary

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01	TECHNOLOGY OF MACHINE TOOLS	S.F KRAR	MC GRAW-HILL BOOK COMPANY EIGHTH EDITION
02	PRODUCTION TECHNOLOGY	R.K. JAIN	KHANNA PUBLISHERS DELHI; 17th edition
03	MACHINE TOOL OPERATION PART-1	TLENTY D. BURGARDT. AURON AXELROD, AND JAMES ANDERSON.	McGraw-Hill Book Company
04	MACHINE TOOL OPERATION PART-2		
05	MACHINE SHOP PRACTICE	SOMENATH DE.	
06	MACHINE TOOLS (WORKSHOP TECHNOLOGY)	R.N DATTA	NEW CENTRAL BOOK AGENCY SECOND EDITION.
07	SHOP THEORY	JAMES ANDERSON, EARL E, TATRO	Mc GRAW-HILL BOOK COMPANY FIFTH EDITION
08	ENGINEERING WORKSHOP MANUAL	E. PULL	STEPHEN AUSTIN AND SONS LTD, HERTFORD ELEVENTH EDITION

Website References:

SI	Web Link	Remarks
01	https://youtu.be/pdf1NTILTrk	Introduction to the lathe machine.
02	https://www.youtube.com/watch?v=uQPCdwegXzc	Different operations on Lathe Machine
03	https://youtu.be/AkeGw0QGQtM	Introduction of the lathe machine.
04	https://youtu.be/jnFAO5033Js	Lathe machine parts and working.
05	https://youtu.be/ext2GSfIXos	Thread cutting practical process in the lathe machine
06	https://youtu.be/a07gtJbK9aU	Practical milling machining operation.

Subject Code	Subject Name	Period per Week		Credit
		T	P	
27231	REFRIGERATION CYCLES AND COMPONENTS	2	3	3

Rationale	<p>The REFRIGERATION & AIR CONDITIONING TECHNOLOGY is essential for modern life. Impact of RAC in the society is increasing gradually. The Refrigeration Cycles and Components is providing opportunity for the students to enhance basic knowledge and skills for modern comfortable life. Over the subject students enhance Conventional and non-conventional refrigeration cycles; Vapor compression refrigeration; Vapor absorption refrigeration; Vapor compression & Vapor absorption refrigeration cycles Components; Thermoelectric refrigeration; Ice refrigeration; Expendable refrigerant refrigeration; Refrigerant Recovery & Recycling; VRF & VRV System; Operation of vapor compression refrigeration cycle; Ammonia-water vapor absorption refrigeration system; water-lithium bromide absorption refrigeration system; components of vapor compression cycles; accessories and auxiliaries; Inverter & Voice Controls AC System; refrigerant & green house effects; Air Curtain, AHU, CCU and FCU in Air Conditioning system; refrigeration oil.</p>
Learning Outcome (Theoretical)	<p>After Completing the subject, students will be able to:</p> <ul style="list-style-type: none"> • State Classification and Differentiate Various types of Conventional & Non-Conventional Refrigeration Cycles • State the features of Vapor Compression and Absorption Refrigeration System. • Illustrate the Vapor Compression and vapor Absorption Refrigeration Cycle Components. • Explain the Accessories and Auxiliaries of Refrigeration Cycles. • Describe & Classify the Refrigerant Recovery & Recycling Systems. • State the Importance of VRF & VRV System. • Describe the Inverter & Voice Controls RAC Systems. • Explain the Characteristics of Refrigerant & Green House Effects. • Describe the Air Curtains, AHU, CCU, FCU. • Illustrate the Characteristics of Refrigerant Oil.
Learning Outcome (Practical)	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> ▪ Identify the Components of Vapor Compression Refrigeration Cycle: ▪ Dismantle and Identify all the Major Working Parts of Seal type Reciprocating Compressor: ▪ Dismantle and Reassemble a Thermostatic Expansion Valve and Identify Internal Parts: ▪ Dismantle and Reassemble an Automatic Expansion Valve and Identify Internal parts: ▪ Identify the Different Refrigerants used in Present Situation by Pressure Temperature Method. ▪ Perform the Transfer Refrigerant from Storage Cylinder to Service Cylinder. ▪ Perform the Recover CFC-12, HCFC-22, HFC-134a and HFC-410A from refrigeration system by Active Method. ▪ Perform the Recover HFC 600a, HCFC-22, HFC-134a and HFC-410A from Refrigeration System by Passive Method.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	<p>CONVENTIONAL & NON- CONVENTIONAL REFRIGERATION CYCLES</p> <p>1.1 List the various conventional and non- conventional refrigeration cycles.</p> <p>1.2 Mention advantages and disadvantages of vapor compression & vapor absorption refrigeration cycles</p> <p>1.3 Discuss the application of vapor compression & vapor absorption refrigeration cycles.</p> <p>1.4 Illustrate the thermoelectric refrigeration system</p> <p>1.5 Mention the advantages & disadvantages of thermoelectric refrigeration system</p> <p>1.6 State basic ice refrigeration & dry ice refrigeration method.</p> <p>1.7 Describe evaporative refrigeration system with its application.</p> <p>1.8 Describe air cycle refrigeration method.</p> <p>1.9 Describe the working principle of steam jet refrigeration & expendable refrigerant refrigeration with its application.</p> <p>1.10 State eutectic plate refrigeration method.</p>	4	8
2	<p>VAPOR COMPRESSION AND ABSORPTION REFRIGERATION SYSTEM</p> <p>2.1 Describe operating principle of vapor compression refrigeration system.</p> <p>2.2 Explain the operating principle of ammonia-water vapor absorption system.</p> <p>2.3 Describe the working principle of water- lithium bromide absorption system.</p> <p>2.4 Discuss the application of different vapor compression & vapor absorption refrigeration system.</p> <p>2.5 Distinguish between water ammonia and lithium bromide absorption system.</p> <p>2.6 Compare vapor compression and absorption refrigeration system.</p>	2	8
3	<p>VAPOR COMPRESSION AND ABSORPTION REFRIGERATION CYCLE COMPONENTS</p> <p>3.1 Mention the basic components of Compression and Absorption refrigeration cycles.</p> <p>3.2 Describe the types, construction and operation of compressors used in refrigeration cycles.</p> <p>3.3 Mention the specific application of different type's compressor.</p> <p>3.4 Explain bore, stroke, swept volume, clearance volume, total volume, compression ratio and capacity of compressor.</p> <p>3.5 Describe the types, construction, operation and application of each condenser.</p> <p>3.6 Describe the types, construction and operation of automatic, thermostatic, low side float valve, high side float valve, orifice and thermoelectric expansion device.</p> <p>3.7 Describe types, construction and operation and application of each evaporator.</p>	3	8
4	<p>ACCESSORIES and AUXILIARIES of REFRIGERATION CYCLES.</p> <p>4.1 State the meaning of accessories and auxiliaries of refrigeration cycles.</p> <p>4.2 List the important accessories used in refrigeration cycles.</p> <p>4.3 List few numbers of auxiliaries used in refrigeration cycles.</p> <p>4.4 Describe the function, construction and position of the strainer, filter drier, accumulator and flush chamber.</p> <p>4.5 Describe the function, construction and position of heat exchanger, pressure relief valve, service valve, receiver, oil separator, liquid indicator, liquid moisture indicator and solenoid valve.</p> <p>4.6 Describe the function, construction and position of reversing valve, check valve, bypass valve and sight glass.</p> <p>4.7 Describe the function, construction and position of safety valve, vibration</p>	2	8

	eliminator, bypass regulator, fusible plug and purge.		
5	REFRIGERANT RECOVERY & RECYCLING SYSTEMS 5.1 Define refrigerant recovery, recycling. 5.2 State the Classification of Refrigerant Recovery System. 5.3 Describe the procedure of vapor refrigerant recovery. 5.4 Explain the Active & Passive method of Refrigerant Recovery System.	2	4
6	VRF & VRV SYSTEM 6.1 Define VRF & VRV System in refrigeration cycles. 6.2 Differentiate between VRF & VRV System in refrigeration cycles. 6.3 Mention the advantage & disadvantage of VRF System. 6.4 Mention the advantage & disadvantage of VRV System. 6.5 Explain the basic working Principle of VRF & VRV System.	2	4
7	INVERTER & VOICE CONTROL RAC SYSTEMS. 7.1 Define Inverter AC System. 7.2 State the Voice Controls RAC Systems. 7.3 Mention the Operating System of Inverter AC System. 7.4 Illustrate the Working Principle of Voice Controls RAC Systems. 7.5 Explain the basic Maintenance of Inverter Type RAC System.	2	4
8	REFRIGERENT & GREEN HOUSE EFFECTS. 8.1 Define refrigerant. 8.2 Mention the types of refrigerant. 8.3 Explain CFCs and the effect of CFCs on environment and alternative of CFCs. 8.4 Explain ODS, Ozone layer and global warming. 8.5 Mention the ODP and GWP value of different types of refrigerant. 8.6 Describe CFC, HCFC, HFC, HC and HC-blend refrigerant and green house effects. 8.7 Explain halocarbons, azeotropics , zeotropics and natural refrigerant. 8.8 Explain saturation pressure-temperature table of refrigerant. 8.9 Mention the application of different types of refrigerant.	3	6
9	AIR COURTAIN, AHU,CCU and FCU 9.1 Define the Air Curtain, AHU, CCU and FCU in Air Conditioning system. 9.2 Describe the Air Curtain, AHU, CCU and FCU in air conditioning system. 9.3 State the maintenance system of the Air Curtain, AHU, CCU and FCU.	2	4
10	REFRIGERENT OIL 8.1 State Refrigerant Oil. 8.2 State the purpose of compressor oil. 8.3 Mention the different types of refrigerant oil. 8.4 Describe the properties of refrigerant oil. 8.5 Explain SAE viscosity number and ISO viscosity grade of refrigerant oil. 8.6 Mention the factors for selecting refrigerant oil. 8.7 Prepare a table of important refrigerant and refrigerant oil.	2	6
	Total	24	60

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Total Marks
1	Identify the Components of Vapor Compression Refrigeration Cycle. 1.1 Identify the components of refrigeration cycle. 1.2 Start the refrigeration system. 1.3 Measure suction and discharge pressure .	1	5

	<p>1.4 Observe temperature on discharge line, condenser, liquid line and suction line.</p> <p>1.5 Observe the effect of refrigeration cycle.</p> <p>1.6 Maintain the record of performed task.</p>		
2	<p>Operate Thermo-Electric Refrigeration System.</p> <p>2.1 Observe the position of heating and cooling side of the thermoelectric system.</p> <p>2.2 Start the system.</p> <p>2.3 Measure ampere of the cycle.</p> <p>2.4 Observe the temperature on cooling and heating element.</p> <p>2.5 Maintain the record of performed task.</p>	1	5
3	<p>Operate the Evaporative Refrigeration System.</p> <p>3.1 Identify the components of evaporative refrigeration cycle.</p> <p>3.2 Measure the voltage and ampere rating of the unit.</p> <p>3.3 Start the unit.</p> <p>3.4 Measure room temperature and the grill temperature of the unit.</p> <p>3.5 Observe performance of the unit.</p> <p>3.6 Maintain the record of performed task.</p>	1	5
4	<p>Observe Major Working Parts of Seal type Reciprocating Compressor.</p> <p>4.1 Identify the external parts of the Seal type compressor.</p> <p>4.2 Select compressor head, valve plate and compressor body.</p> <p>4.3 Mark compressor head, valve plate and compressor body.</p> <p>4.4 Dismantle the compressor.</p> <p>4.5 Identify the internal parts of the compressor.</p> <p>4.6 Observe the operation of the compressor.</p> <p>4.7 Assemble the compressor parts.</p> <p>4.8 Maintain the record of performed task.</p>	1	5
5	<p>Dismantle, Reassemble and Identify Internal Parts of a Thermostatic Expansion Valve.</p> <p>5.1 Identify the external parts of the thermostatic expansion valve.</p> <p>5.2 Dismantle the thermostatic expansion valve.</p> <p>5.3 Identify the internal parts of Thermostatic Expansion Valve.</p> <p>5.4 Reassemble the TEV.</p> <p>5.5 Maintain the record of performed task.</p>	1	5
6	<p>Dismantle, Reassemble and Identify Internal Parts an Automatic Expansion Valve.</p> <p>6.1 Identify the external parts of the automatic expansion valve.</p> <p>6.2 Dismantle the automatic expansion valve.</p> <p>6.3 Identify the internal parts.</p> <p>6.4 Reassemble the expansion valve.</p> <p>6.5 Maintain the record of performed task.</p>	1	5
7	<p>Identify the Different types of Refrigerants by Pressure Temperature Method.</p> <p>7.1 Mark 1, 2 & 3 on three different refrigerant cylinders.</p> <p>7.2 Measure room temperature.</p> <p>7.3 Measure the pressure of refrigerant cylinder 1, 2 & 3.</p> <p>7.4 Compare temperature pressure with the refrigerant temperature- pressure chart.</p> <p>7.5 Decide the name of the refrigerant of cylinder 1,2 & 3.</p> <p>7.6 Maintain the record of performed task.</p>	1	5
8	<p>Perform the Transfer Refrigerant from Storage Cylinder to Service Cylinder.</p> <p>8.1 Evacuate service cylinder</p>		

	<p>8.2 Measure weight of the service cylinder</p> <p>8.3 Connect hose between storage and service cylinder.</p> <p>8.4 Cool the service cylinder</p> <p>8.5 Purge connected hose</p> <p>8.6 Open the cylinder valve</p> <p>8.7 Observe weight of the service cylinder for required amount of refrigerant.</p> <p>8.8 Close the storage cylinder valve and service cylinder valve.</p> <p>8.9 Maintain the record of performed task.</p>	1	5
9	<p>Perform the Recover CFC-12, HCFC-22, HFC-134a and HFC-410A from refrigeration system by Active Method.</p> <p>9.1 Observe the pressure of the refrigerant of the refrigerating unit to be recovered .</p> <p>9.2 Connect charging hose with the recovery machine, recovery cylinder and the refrigerating unit to be recovered.</p> <p>9.3 Purge the connected hoses.</p> <p>9.4 Open the cylinder valve and the refrigerating unit valve .</p> <p>9.5 Start the recovery machine.</p> <p>9.6 Observe the suction pressure and close the cylinder valve until the pressure at zero.</p> <p>9.7 Stop the recovery machine</p> <p>9.8 Maintain the record of performed task.</p>	1	5
10	<p>Perform the Recover HFC 600a, HCFC-22, HFC-134a and HFC-410A from Refrigeration System by Passive Method.</p> <p>10.1 Cool the recovery cylinder by ice and water.</p> <p>10.2 Observe the pressure of the refrigerant of the refrigerating unit to be recovered.</p> <p>10.3 Connect charging hose with the recovery cylinder and the refrigerating unit to be recovered.</p> <p>10.4 Cool the recovery cylinder and set on a weighing scale.</p> <p>10.5 Open the valve of the refrigerating unit and purge the charging hose.</p> <p>10.6 Open the cylinder valve.</p> <p>10.7 Observe the pressure and close the valve till the pressure stands.</p> <p>10.8 Observe the weight and close the valves.</p> <p>10.9 Maintain the record of performed task.</p>	1	5
	Total	10	50

Necessary Resources (TOOLS, EQUIPMENT & MATERIALS OF RAC):

Sl	Item Name	Quantity
01	Sling Psychrometer	15 set
02	Digital Multimeter	15 set
03	Clamp Meter/Clip on AVO Meter	15 set
04	Window AC	10 pcs
05	Split Type Ac	15 pcs
06	Dehumidifier	10 set
07	Split Type Ac,	15 set
08	Humidifier,	15 set
09	Tube Bender	15 set
10	Reamer	10 pcs
11	Flaring Tool Set	10 set
12	Swagging Tool Set,	10 set
13	Brazing Alloy,	50 pcs
14	Hammer	20 pcs

15	Manifold & Gauge Set W/5 Ft Hoses	15 set
16	Ball Valves	10 set
16	R-134a , R600a, R-410A, R-32Refrigerant	15 cylinders
17	Capacitor 40/70 mfd	10 pcs
18	Service Wrench	25 pcs
19	Screwdrivers (Philip & Slotted)	10 pcs
20	Tape Rule Nut Drivers (1/4" & 5/16")	10 pcs
21	Wire cutter/stripper/crimper	10 pcs
22	Needle nose plier 10"	25 pcs
23	adjustable wrench 12"	25 pcs
24	adjustable wrench 18"	25 pcs
25	Safety glasses/goggles	30 pcs
26	10" Vice grip	15 pcs
27	Thermocouple (optional)	30 pcs
28	IR thermometer (optional)	25 pcs
29	Leather gloves	20 pcs
30	Sharpie Marker	10 pcs
31	Adjustable Joint Pliers	15 pcs
32	Allen Wrench Set	10 set
33	Flashlight with magnet or hook mount Pocket Knife or Box Cutter Screwdriver	10 pcs
34	Digital Camera	15 pcs
35	Set (Straight and Phillips)	25 pcs
36	Electronic leak detector	5 pcs
37	Recovery cylinder	10 pcs
38	Refrigerant scale	10 pcs
39	Tubing Cutter	25 pcs
40	Nut Driver Sets (standard and metric)	25 pcs
41	Screwdrivers	30 pcs
42	Core Removal Tool Pocket	10 pcs
43	12" Combination Square Recovery Machine	5 pcs
44	Speed Clean Coil Jet CJ-125 HVAC Coil Cleaner	10 pcs
45	Hose Gaskets (spares for manifold hoses)	30 pcs
46	Pocket Thermometer	30 pcs
6	Box Wrench Set	25 Set
48	Gas Welding Set	05 Set
49	Hand gloves, Safety shoe, Apron	15 Set
50	Lokring Set	10 Set
51	Recovery Machine	05 sets

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01	Fundamentals of Refrigeration	Billy C. Langley	Delmar, 1995
02	Modern Refrigeration and Air-conditioning	Althouse/Turnquest/Bracciano	Goodheart-Willcox Pub; 8th edition (June 1, 2000)
03	Basic Refrigeration and Air-conditioning	P N Ananthanarayanan	Tata McGraw-Hill Education, 2005

04	A Text Book of Refrigeration and Air-conditioning	R. S. Khurmi, J. K. Gupta	Eurasia Publishing House, 1992
05	Principle of Refrigeration	Roy J. Dossat	Prentice Hall, 1997
06	Industrial refrigeration Handbook	Wilbirt F stoecker	McGraw-Hill Publishing Company, 1983
07	A course in refrigeration and air conditioning	Arora Domkundwar	Paperback – 1 January 2018
08	Lubricants and lubrication Theomang and Wilfried Dresel	WILEY-VCH	

Website References:

Sl	Web Link	Remarks
01	https://books.google.com.bd/books/about/Fundamentals_of_Refrigeration.html?id=iDaXPQAACAAJ&redir_esc=y	
02	https://ia800706.us.archive.org/33/items/ModernRefrigerationAndAirConditioning/Modern_Refrigeration_and_Air_Conditioning.pdf	
03	https://books.google.com.bd/books?id=gniJE5IK0YAC&printsec=frontcover&source=gb_s_ge_summary_r&cad=0#v=onepage&q&f=false	
04	https://books.google.com.bd/books/about/A_Text_Book_of_Refrigeration_and_Air_con.html?id=MrBaGwAACAAJ&redir_esc=y	
05	https://books.google.com.bd/books/about/Principles_of_Refrigeration.html?id=iNNTAAAAMAAJ&redir_esc=y	
06	https://www.goodreads.com/book/show/2503455.Industrial_Refrigeration_Handbook	
07	https://www.amazon.in/Course-Refrigeration-Air-Condition-Environmental-Engineering/dp/B082D4Q61M	

Subject Code	Subject Name	Period Per Week		Credit
		T	P	
28511	COMPUTER OFFICE APPLICATION	0	6	C
				2

Rationale	This is a generic course for all diploma programs required to enable the graduates to use and work with ICT competently. It includes typing in Bangla and English, using the internet for e-communication & e-interaction, operating a computer and allied devices, Operating Word Processing, Spreadsheet Analysis, and Presentation software. This course also enables a graduate to adopt further study in upper-level courses using IT and other sectors. This course is designed to emphasize practical aspects rather than theory.
Course Learning Outcome	<p>After undergoing the subject, students will be able to:</p> <ul style="list-style-type: none"> • type Bangla and English smoothly • use internet for e-communication & interaction • operate a computer and allied devices • perform the operation of Word Processing App, Spreadsheet Application, and Presentation Package.

Detailed Syllabus (Practical)

CLO	Experiment name with the procedure	Class (3 Periods per class)	Marks
1	<p>TYPE TEXT AND DOCUMENTS IN ENGLISH AND BANGLA.</p> <p>1.1 Startup and Shutdown of a computer.</p> <p>1.1.1 Identify Basic Computer Hardware devices Computer Hardware: System Unit, Motherboard, Processor, Power supply, SSD, Hard Disk, RAM, ROM</p> <p>1.1.2 Check Peripherals and connect with the system unit. Peripherals: Monitor, Keyboard, Mouse, Modem, Scanner, Printer, Multimedia Projector</p> <p>1.1.3 Connect Power cords/adaptor properly with computer and power outlets socket.</p> <p>1.1.4 Switch on the Computer gently.</p> <p>1.1.5 Arrange and customize PC Desktop / GUI settings as per requirement. Desktop / GUI settings: Icons, Taskbar, View, Resolutions</p> <p>1.1.6 Close Unsaved files and folders</p> <p>1.1.7 Close Open software and switch off hardware devices.</p> <p>1.1.8 Switch off Computer gently.</p> <p>1.1.9 Switched off Power at the respective power outlets.</p> <p>1.2 Install the Typing Tutor software.</p>	3	5

	<p>1.2.1. Identify Required <i>Hardware</i> and <i>software</i> of typing Tutor software. Software: Operating System, Microsoft Office, Open Office, Typing Tutor, Bangla Typing Software, Google doc, Avro, Bijoy.</p> <p>1.2.2. Install English and Bangla Typing tutor software.</p> <p>1.2.3. Install Bangla Unicode Typing Tutor Software.</p> <p>1.2.4. Install Required fonts for typing of Bangla and English.</p> <p>1.3 Practice text Typing in English and Bangla.</p> <p>1.3.1 Start Typing tutor software.</p> <p>1.3.2 Practice English Home key drilling systematically.</p> <p>1.3.3 Practice Typing in English as per Standard procedure (30 WPM).</p> <p>1.3.4 Install Specialized Bangla Typing tutor software.</p> <p>1.3.5 Practice systematically Bangla Home key typing.</p> <p>1.3.6 Type Bangla document as per standard procedure (20 WPM).</p> <p>1.3.7 Type Text documents repeatedly to increase typing speed in both English and Bangla.</p> <p>1.3 Maintain the record of the performed job.</p>		
2	<p>USE THE INTERNET FOR E-COMMUNICATION & INTERACTION</p> <p>2.1 Access resources from the internet</p> <p>2.1.1. Interpret Internet Terms and their uses. Internet Terms: Browser, web page, URL, HTML and http/https, E-mail, social media, IP, Download, Malware, Router, Bookmark, E-commerce</p> <p>2.1.2. Select and install Appropriate internet browsers Internet browsers: Microsoft Edge, Google Chrome, Internet Explorer, Opera, Safari, QQ Browser, UC, Yandex</p> <p>2.1.3. Carry out Browser Settings for smooth operation. Browser Settings: Synchronization, Privacy and Security, Auto fill, Appearance, Language, Download, Accessibility</p> <p>2.1.4. Open the Internet browser and write/select a web address / URL in /from the address bar to access Information. Information: Text Information, Graphics, Video</p> <p>2.1.5. Use Search engines to access information. Search engines: Google, Yahoo, Alta Vista, Msn, Bing</p> <p>2.1.6. Use internet resources (Free and Paid Platform)</p> <p>2.1.7. Share/download/upload Video / Information From/to web site/social media. social media: Facebook, Twitter, LinkedIn, YouTube</p> <p>2.1.8. Communicate using social media and professional's Media.</p> <p>2.1.9. Search and follow Netiquette' (or web etiquette) Principles.</p> <p>2.2 Use Web Services.</p>	4	6

	<p>2.2.1. Identify Web Services and service provider as per job requirement. Web Services: Communication (Zoom, Bip, Meet), Storage (Drop box, Mega, One Drive, Google Drive)</p> <p>2.2.2. Interpret the Function of the web services</p> <p>2.2.3. List Information for creating an account in web Services.</p> <p>2.2.4. Identify Google services. Google services: Drive, Calendar, Map, Translator, Docs, Sheets, Slide, Forms, Search, Contact, Classroom, Image Search, Blogger, Meet</p> <p>2.2.5. List Functions of Google services.</p> <p>2.2.6. Demonstrate Google Services.</p> <p>2.3 Use and manage E-mail.</p> <p>2.3.1 Identify and select E-mail services to create a new e-mail address. E-mail services: Free mail services (Gmail, Yahoo, Hotmail), Webmail Services</p> <p>2.3.2 Compose E-mail and attach prepared document.</p> <p>2.3.3 Send E-mail to different types of recipients using the CC and BCC option.</p> <p>2.3.4 Read, forward, reply, and delete E-mail as per requirement.</p> <p>2.3.5 Create and manipulate custom email folders.</p> <p>2.3.6 Print E-mail message.</p> <p>2.4 Maintain the record of the performed job.</p>		
3	<p>OPERATE A COMPUTER AND ALLIED DEVICES</p> <p>3.1 Perform Basic Setting</p> <p>3.1.1 Change power options properties as per requirement.</p> <p>3.1.2 Terminate Non-responding application as specified.</p> <p>3.1.3 Identify and adjust System information, operating system version, date & Time display system, color settings, and available RAM as per job requirement.</p> <p>3.1.4 Set Keyboard Language according to the instructions.</p> <p>3.1.5 Install Fonts following standard procedures.</p> <p>3.1.6 Adjust Screen Resolution as per job requirement.</p> <p>3.1.7 Identify Basic Hardware and Software problems and take the remedy. Hardware and Software problem: Can't Open, Slow, Hang, Display Problem, Setting Problem, Keyboard and Mouse Problem, Sound Problem, Input devices are not working, No network, Slow internet, Printer is not working, Software installation problem</p> <p>3.2 Operate Computer</p> <p>3.2.1 Create Files and folders</p> <p>3.2.2 Manipulate Files and folders as per requirement. Manipulated: Opened, Copied, Renamed, Deleted, Sorted.</p> <p>3.2.3 View and search Properties of files and folders.</p> <p>3.2.4 Practice Control panel settings.</p> <p>3.2.5 Format and defragment Storage devices as per requirement. Storage devices: Hard drive, Flash Drive, Flash Memory</p> <p>3.2.6 Take Backups as required.</p> <p>3.2.7 use and change Password as per job requirement</p>	3	5

	<p>3.3 Manage Security of Hardware and Software.</p> <p>3.3.1 Installed Custom software and Antivirus software according to standard operating procedure.</p> <p>3.3.2 Scan Storage devices using antivirus software.</p> <p>3.3.3 Scan Folders and Files using the current version of Software.</p> <p>3.3.4 Update Scanning software or virus definition regularly.</p> <p>3.3.5 Identify Cyber Security issues or hardware and software. Cyber Security issues: Hacking, Phishing, Data Leakage, Threat</p> <p>3.3.6 Recognize and avoid Cyber threats and attacks.</p> <p>3.4 Manage Printer and Printer settings</p> <p>3.4.1 Install Printers on the computer according to the manufacturer's instructions.</p> <p>3.4.2 Print Documents from an application.</p> <p>3.4.3 Print, pause, restart, or cancel using print manager.</p> <p>3.5 Maintain the record of performed job</p>		
4	OPERATE WORD PROCESSING APPLICATION		
	<p>4.1 Create documents.</p> <p>4.1.1. Open Word-processing application. Word-processing application: MS Word, Open Office</p> <p>4.1.2. Create Documents. (Word documents, Standard CV with different text & Fonts, image, and table, Application / Official letter with proper paragraph and indenting, spacing, styles, illustrations, tables, header & footers and symbols, Standard report/newspaper items with column, footnote, and endnote drop cap, indexing and page numbering)</p> <p>4.1.3. Add Text and Data according to information requirements.</p> <p>4.1.4. Use Document templates as per the job required.</p> <p>4.1.5. Use Formatting Tools when creating the document. Formatting Tools: (Bold, Italic, Underline, Strikethrough, Subscript, Superscript, Change case, Text highlight color, Font color, Font, Font size, Clear formatting, Format painter, Illustrations and styles, Text, Table, Symbols, Header & footer, Text alignment)</p> <p>4.1.6. Insert and edit Equation as per job requirement.</p> <p>4.1.7. Save Documents are as per job requirements.</p> <p>4.2 Customize basic settings to meet page layout conventions</p> <p>4.2.1 Adjust Page layout to meet information requirements</p> <p>4.2.2 Open and use User interface and toolbars as per job requirement. Toolbars: File tab, Title bar, Ribbon, Ruler, Status bar, View button, Zoom control, Document area, Dialog box launcher, Backstage view</p> <p>4.2.3 Change Font Format to suit the purpose of the document. Font Format: Times New Roman, Arial, Nikosh, NikoshBan, Kalpurush,</p>	8	16

- SutonnyMJ, Century, Century gothic, Vrinda
- 4.2.4 Change **Alignment** and line spacing according to document requirements.
Alignment: Left, Right, Center, Top, Text direction, Cell margins
- 4.2.5 Modify Margins to suit the purpose of the document.

4.3 Format documents

- 4.3.1 Use formatting features, Symbols, and styles as per requirement.
- 4.3.2 Highlight and Copy Text from other areas in the document or form another active document.
- 4.3.3 Insert headers and footers to incorporate necessary data.
- 4.3.4 Save Documents in another **file format**
file format: .doc, .docx, .pdf, .xps, .xml
- 4.3.5 Save and close document to **Storage device**.
Storage device: Flash Drive, Hard Disk Drive, Memory Card, CD/DVD

4.4 Create a table.

- 4.4.1 Insert the standard table into the document.
- 4.4.2 Split and /or merge the cells to meet the Information requirement.
- 4.4.3 Insert, delete, modify and move columns and rows if Necessary.
- 4.4.4 Insert Text into the table.
- 4.4.5 Operation carried for **Data Handled** as per job Requirement.
Data Handled: Sort, Repeat Header row, convert to Text, Formula, Autofit.
- 4.4.6 Use Styling tools according to style requirements.
- 4.4.7 Add formula to the table as per job requirement.

4.5 Add illustrations

- 4.5.1 Insert appropriate **illustrations** into the document and Customize if necessary.
Illustrations: Picture, clip art, Shapes, Smart Art, Chart
- 4.5.2 Position and resize images according to the Document formatting requirements.

4.6 Perform mail merge operation

- 4.6.1 Determine sender and recipients as per job Requirements.
- 4.6.2 Follow preparatory steps for mail merge.
- 4.6.3 Add recipients for mail merge.
- 4.6.4 Perform Mail merge operation.
- 4.6.5 Send mail.

4.7 Create references

- 4.7.1 Plan Footnote, endnote, and citation.
- 4.7.2 Create Footnote and endnote.
- 4.7.3 Create citation.

4.8 Print information

- 4.8.1 Connect **printer** with computer and power outlet Properly.
Printer: Dot matrix printer, Laser Printer, Inkjet printer
- 4.8.2 Switch on power at both the power outlet and

	<p>printer.</p> <p>4.8.3 Install and add printer.</p> <p>4.8.4 Select correct printer settings and print the document or selected part as per job requirements.</p> <p>4.8.5 View or cancel print from the printer pool.</p> <p>4.9 Maintain the record of the performed job.</p>		
5	<p>OPERATE SPREADSHEET APPLICATION</p> <p>5.1 Create spreadsheets</p> <p>5.1.1. Open <i>Spreadsheet Application</i>,</p> <p>5.1.1. Create spreadsheet files and enter numbers, text, and symbols into cells according to information requirements.</p> <p>5.1.2. Enter simple formulas and functions using cell Referencing where required.</p> <p>Formulas: SUM, AVERAGE, IF, MAX, MIN, COUNT, RANK, Date and Time, Math and Trig, AND, OR, NOR, Between, ABS, Greater than, less than</p> <p>Functions: Mathematics, Logical, Simple statistical</p> <p>5.1.3. Correct formulas when error messages occur.</p> <p>5.1.4. Use a range of common tools during spreadsheet development.</p> <p>5.1.5. Edit columns and rows within the spreadsheet.</p> <p>5.1.6. Use the auto-fill function to increment data where required.</p> <p>5.1.7. Save spreadsheet file to directory or folder.</p> <p>5.2. Customize basic settings:</p> <p>5.2.1. Adjust page layout to meet user requirements or special needs.</p> <p>5.2.1. Open and view different toolbars.</p> <p>5.2.2. Change font settings so that they are Appropriate for the purpose of the Document.</p> <p>5.2.3. Change alignment options and line spacing according to spreadsheet formatting features.</p> <p>Alignment: Right, Left, Centre, Top, Middle, Bottom</p> <p>5.2.4. Format cell to display different styles as required.</p> <p>Format: Bold, Italic, Underline, Font size, color, change case, Alignment, and intend</p> <p>5.2.5. Modify margin sizes to suit the purpose of the spreadsheets.</p> <p>5.2.6. View multiple spreadsheets concurrently.</p> <p>5.3. Format spreadsheet:</p> <p>5.3.1. Use formatting features as per job requirements.</p> <p>5.3.2. Copy selected formatting features from another cell in the spreadsheet or from another active spreadsheet.</p> <p>5.3.3. Use formatting tools as required within the spreadsheet.</p> <p>5.3.4. Align information in a selected cell as required.</p> <p>5.3.5. Insert headers and footers using formatting features.</p> <p>5.3.6. Save the spreadsheet in another format.</p> <p>5.3.7. Save and close the spreadsheet to the storage device.</p> <p>5.4. Sort and filter data in worksheet</p> <p>5.4.1. Create worksheets.</p> <p>5.4.2. Insert data into the sheet.</p> <p>5.4.3. Sort data with different criteria.</p> <p>5.4.4. Filter data with different conditions,</p> <p>5.4.5. Print sorted or filtered data</p> <p>5.5. Incorporate object and chart in the spreadsheet:</p>	6	10

	<p>5.5.1. Import an object into an active spreadsheet. 5.5.2. Manipulate imported objects by using formatting features. 5.5.3. Create a chart using selected data in the spreadsheet. 5.5.4. Display selected data in a different chart. 5.5.5. Modify chart using formatting features.</p> <p>5.6. Create worksheets and charts 5.6.1. Create Worksheets as pre-requirement. 5.6.2. Enter Data as per job requirement. 5.6.3. use function for calculating and editing logical operations. 5.6.4. Format Sheets as per requirement. Sheets: Salary Sheet with sorting, filtering, and chart, Mark/Grade/Tabulation sheets for simple result processing. 5.6.5. Create Charts and Graphs as per job requirements. Charts and Graphs: Column, Pie, Line, Bar, Table, Scatter 5.6.6. Preview and print Charts/ Sheets.</p> <p>5.7. Print spreadsheet: 5.7.1. View spreadsheet in print preview mode. 5.7.2. Select basic printer options. 5.7.3. Print spreadsheet or selected part of the spreadsheet. 5.7.4. Submit the spreadsheet to the appropriate person for approval or feedback.</p> <p>5.8. Maintain the record of the performed job.</p>		
6	<p>OPERATE PRESENTATION PACKAGE:</p> <p>6.1. Create presentations: 6.1.1 Open Application package for presentation and create a simple design for a presentation according to organizational requirements. Application package: PowerPoint, Prezi 6.1.2 Open a blank presentation and add text and graphics using the user interface and toolbar. 6.1.3 Apply existing styles within a presentation. 6.1.4 Use presentation templates and slides to create a presentation. 6.1.5 Use various Illustrations, audio, video, and effects in the presentation. Illustrations: Picture, Clip art, Photo, Shape, Smart art, Chart Effects: Entrance, Emphasis, Exit, Motion path, Sound 6.1.6 Add design, transition, and animation as per job requirement 6.1.7 Save the presentation to the correct directory.</p> <p>6.2 Customize basic settings: 6.2.1 Adjust display to meet user requirements. 6.2.2 Open and view different toolbars to view options. 6.2.3 Ensure font settings are appropriate for the purpose of the presentation. 6.2.4 Select necessary font tools as per job requirements. 6.2.5 View multiple slides at once.</p> <p>6.3 Format presentation 6.3.1 Use and incorporate organizational charts, bulleted lists and modify as required. 6.3.2 Add and manipulate objects to meet presentation purposes. Objects: image, chart, worksheet, equation, slide 6.3.3 Import and modify objects for presentation purposes. 6.3.4 Modify slide layout, including text and colors to meet presentation requirements. 6.3.5 Use formatting tools as required within the presentation. 6.3.6 Duplicate slides within and/or across a presentation. 6.3.7 Record the sequence of slides and/or delete slides for presentation purposes.</p>	4	8

<p>6.3.8 Save the presentation in another format.</p> <p>6.3.9 Save and close presentation to disk.</p> <p>6.4 Add Slide show effects</p> <p>6.4.1 Incorporate animation and multimedia effects into the presentation as required to enhance the presentation and present the presentation.</p> <p>6.4.2 Add Slide transition effect to ensure a smooth presentation.</p> <p>6.4.3 Test the presentation for overall impact</p> <p>6.4.4 Use on-screen navigation tools to start and stop slide shows or move between different slides.</p> <p>6.5 Create a template using a master slide</p> <p>6.5.1 Open Blank presentation and click the slide master form view tab.</p> <p>6.5.2 Create slide layout and/or customized as per requirements.</p> <p>6.5.3 Add Theme based colors, fonts, effects, backgrounds and style to the presentation.</p> <p>6.5.4 Set page orientation for all of the slides.</p> <p>6.5.5 Save and close presentation</p> <p>6.6 Print presentation and notes</p> <p>6.6.1 Select the appropriate print format to print presentation.</p> <p>6.6.2 Select preferred slide orientation.</p> <p>6.6.3 Add notes and slide numbers.</p> <p>6.6.4 Preview slide and check spells before presentation.</p> <p>6.6.5 Print selected slides.</p> <p>6.7 Maintain the record of performed job.</p>			
	Total	28	50

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

Sl	Item Name	Quantity
01	Computer System / Laptop	01 per student
Accessories		
02	Extra Key Board	05 Piece
03	Extra Mouse	05 Piece
04	Extra System / Laptop Unit	02 Piece
05	Extra Mother Board	02 Piece
06	Extra RAM	05 Piece
07	Extra Hard Disk	02 Piece
08	Extra SSD	02 Piece
09	Multimedia Projector	01 Piece
10	Multimedia pointer	01 Piece
11	Potable wireless Sound System	01 set
12	Network Adapter	02 Piece
13	VGA cable	02 Piece
14	Printer (LASER)	01 Piece
15	Printer (Dot Matrix)	01 Piece
16	Printer (Inkjet)	01 Piece
17	Printer Cable	01 Piece
18	Monitor	01 Piece
19	Modem	01 Piece
20	Scanner	01 Piece

21	Power cords/Power adapter	01 Piece
22	UPS/ IPS	01 Piece

Recommended Books:

SI	Book Name	Writer Name	Publisher Name & Edition
01	MOS 2010, Study Guide	<u>Joan ambert,</u> <u>Joyce Cox</u>	Up-to-date Edition
02	Computer Application in Business	<u>R. Parameswaran</u>	

Website References:

SI	Web Link	Remarks
01	https://teachers.tech/microsoft-office-tutorials/	
02	https://www.javatpoint.com/ms-word-tutorial	
03	https://www.tutorialspoint.com/word/index.htm	