BANGLADESH TECHNICAL EDUCATION BOARD

Agargaon, Sher-E-Bangla Nagar

Dhaka-1207.

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

ELECTRONICS TECHNOLOGY
TECHNOLOGY CODE: (68)

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

DIPLOMA IN ENGINEERING CURRICULUM
COURSE STRUCTURE

(PROBIDHAN-2022)

TECHNOLOGY NAME: ELECTRONICS TECHNOLOGY (68)

(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	25811	Social Science	2	-	2	40	60	100	-	-	-	100
4	25812	Physical Education & Life skills Development	-	3	1	-	-	-	25	25	50	50
5	25913	Chemistry	3	3	4	60	90	150	25	25	50	200
6	25921	Mathematics-II	3	3	4	60	90	150	25	25	50	200
7	26721	Electrical Circuits-I	3	3	4	60	90	150	25	25	50	200
8	26821	Electronic Devices and Circuits	3	3	4	60	90	150	25	25	50	200
Total			**18**	**15**	**23**	**360**	**540**	**900**	**125**	**125**	**250**	**1,150**

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

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

Rationale	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.
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to:** • 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.	**BASIC CONCEPTS OF SOCIAL SCIENCES** 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.	**03**	**05**
2.	**SOCIETY AND CITIZENSHIP** 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.	**02**	**04**
3.	**STATE, GOVERNMENT, LAW AND GOOD GOVERNANCE** 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.	**04**	**08**
4.	**SOCIALIZATION, SOCIAL CONTROL AND SOCIAL CHANGE** 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.	**03**	**05**

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

DIPLOMA IN ENGINEERING
DETAILED SYLLABUS
PROBIDHAN-2022

Subject Code	Subject Name	Period per Week		
		T	P	C
25812	PHYSICAL EDUCATION & LIFE SKILLS DEVELOPMENT	0	3	1

Rationale	To enhances body fitness by regular exercise that promotes strong muscles and bones. It will help students to develop as patriotic citizen by acquiring knowledge about liberation war and different national days. It will also increase the unity, patience, obedience, discipline and punctuality of students through regular physical exercise. Student will be able to acquaint with the common games, sports and make aware of first aid procedure and develop life skill.
Learning Outcome	**After undergoing the subject, students will be able to:** ➢ Perform daily assemble & National Anthem in the right way. ➢ Apply different technique of exercise for developing body fitness. ➢ Identify the various kinds of physical exercise and practice properly. ➢ Select correct equipment of exercise and use them for particular physical Development.

Unit Description:

Unit	Experiment Name & Procedure	Class (3 Period)	Mark (Continuous)
1	**PERFORM ASSEMBLY** 1.1 Lifting National Flag according to Rules of measurement. 1.2 Perform Line, File and Squad Drill. 1.3 Perform assembly. 1.4 Recite national anthem. 1.5 Recite National anthem in music.	**1**	**2**
2	**PERFORM WARM-UP WITH PICTORIAL** 2.1 Perform Spot running (Slow, Medium & Fast), Neck rotation and Hand rotation of general Warm-up. 2.2 Perform Side twisting, Toe touching, Hip rotation, Ankle twisting, sit up and Upper body bending (Front & Back) of general Warm-up. 2.3 Perform Legs raising one by one, Leg raising in slanting position, Knee bending and nose touching of Specific warm up. 2.4 Perform Heels rising, toes touching (standing and laying position), Hand stretch breathing (Tad asana, Horizontal, Vertical) of Specific warm up. 2.5 Perform Hand rising, Side twisting, Front and Back bending, Front curl of Mass physical Exercise. 2.6 Perform Straight arm curl two hand, Hands rising overhead and Push up of Mass physical Exercise.	**2**	**2**
3	**PERFORM YOGA** 3.1 Perform Dhyanasan, Shabasan, Padmasan, Gomukhasan, Sharbangasan, Shashangasan, Shirshan. 3.2 Perfrom Shasthyasan, Halasan, Matshasan, Paban Muktasan, Ustrasan. 3.3 Perfrom Prana and Pranyama, Nadisuddhi Pranayma, cooling pranaymas(Sitali pranayama, Sitkari pramayama, Sadanta pranayama),Ujjayi Pranayama.	**1**	**2**

4	**DEVELOP MUSCLE** 4.1 Practice Dumbbell Front curl, Hand sidewise, stretches, Arms raising overhead. 4.2 Practice Front press, Leg press and owing motion by using Barbell. 4.3 Practice Straight way climbing, Leg rising climbing of Rope climbing. 4.4 Practice Chinning the bar with front grip, Chinning the bar with wide back grip by using Horizontal bar. 4.5 Practice Slow Medium and Fast running by using Trade Mill. 4.6 Practice Sit up by using Sit up bench. 4.7 Perform Push-up with Push-up Bar. 4.8 Perform Dips behind the back with Flat Bench or Iron Stolls.	**1**	**2**
5	**PERFORM GAMES AND SPORTS** 5.1 Perform Kabadi 5.2 Perform Football 5.3 Perform Cricket 5.4 Perform Volleyball 5.5 Perform Badminton 5.6 Perform Athletics 5.7 Perform Swimming.	**1**	**3**
6	**PRACTICE SPORTS SCIENCE** 6.1 Demonstrate Exercise physiology 6.2 Identify Function of muscles. 6.3 Define work, Energy and power. 6.4 Mention Effect of exercise on Heart and Circulatory system. 6.5 Mention the Motor components for physical fitness. 6.6 Define Sports Biomechanics. 6.7 Define Sports Psychology. 6.8 Define Nutrition, Diet and Balanced diet. 6.9 Define Test, Measurement and Evaluation.	**1**	**2**
7	**CELEBRATE LIBERATION WAR AND NATIONAL DAYS OF BANGLADESH** 7.1 Liberation war of Bangladesh (Short Histor) 7.2 Celebrate Martyr"s Day (21 February). 7.3 Celebrate Birth day of Bangabandhu (17 March). 7.4 Celebrate Independence Day (26 March). 7.5 Celebrate Bangali New Year Day (1st Boishakh).	**1**	**2**

	7.6	Celebrate National Mourning Day (15 August).		
	7.7	Celebrate Victory Day (16 December).		
	7.8	Celebrate Martyred Intellectual Day (14 December).		
	7.9	Celebrate Others Historical Days selected by government.		
8	**MAINTAIN HUMAN RELATION AND PERFORM SOCIAL WORK** 8.1 Identify tools of First Aid. 8.2 Apply First Aid. 8.3 Identify Responsibilities of a First Aider. 8.4 Identify Different types of Equipment of First Aid. 8.5 Apply Muscle Cramp-Ice Application (Remedy). 8.6 Apply Dislocation-Ice Application (Remedy).		**2**	**2**
9	**ELASTICITY** 9.1 Maintain Family Relation 9.2 Maintain Relation with neighbor. 9.3 Provide Humanitarian Service. 9.4 Provide Service for handicapped (Intelligent, Physical, Social 9.5 Provide Service for Orphan/Patient 9.6 Perform Tree plantation 9.7 Perform Blood Donation, Campus Cleaning, recycling, Gardening, Green Campus of Community Service 9.8 Perform Rover Scout 9.9 Perform Sanitation and Pure Drinking Water 9.10 Perform Social Culture.		**3**	**4**
10	**CONTROL STRESS MANAGEMENT AND PRACTICE INTERVIEW TECHNIQUE** 10.1 Identify Habit to be a man of Humor 10.2 Keep Brain Always Cool. 10.3 Practice Positive Thinking. 10.4 Identify Factors that Determine our Attitude 10.5 Identify benefits of a Positive Attitude. 10.6 Identify Steps to Building a Positive Attitude. 10.7 Prepare Mentally and physically to face an interview 10.8 Select Dress for interview 10.9 Practice Introduce myself to the interview 10.10 Practice Coping Interview.		**3**	**4**
		Total	**16**	**25**

Necessary Resources (Tools, Equipment's, machinery)

SL	ITEM	QUANTITY
01	Football	
02	Volleyball	
03	Volleyball Net	
04	Badminton Racket	
05	Badminton Shuttle Cork	
06	Badminton Net	
07	Cricket Ball	
08	Cricket Bat	
09	Cricket Stamp	
10	Push-up Bar	
11	Adjustable Dumbbell	
12	Adjustable Barbell	
13	Thick Rope for Climbing with Hanging Set-up	
14	Horizontal Bar (Custom Made)	
15	Flat Bench/Tool with Foam Sit	
16	Sit-up Bench	

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
1.	Modern Yoga	Kany Lal Shah	
2.	Rules of games and Sports	Kazi abdul Alim	
3.	Yoga	Sobita Mallick	
4.	Iron Man	Nilmoni Dass	

Subject Code	Subject Name	Period per Week		Credit
25913	CHEMISTRY	T	P	C
		3	3	4
Rationale	**Chemistry is the branch of science that deals with study of matter, its composition, physical and chemical properties and applications. It is important for diploma engineers to have knowledge of chemistry as those may face problems in fields as diverse as design and development of new materials, quality control and environmental engineering that are basically chemistry oriented in nature. Chemistry is the backbone in designing and understanding the nature of various engineering materials. Many advances in engineering and technology either produce a chemical demand. The subject covers atomic structure, chemical reaction, ionic equilibrium, organic and vocational chemistry to understanding and application. The emphasis will be more on teaching practical aspect rather than theory.**			
Learning Outcome (Theoretical)	**After undergoing the subject, students will be able to:** **Describe Atomic Structure** **Describe Symbol, valency and radical** **Describe Properties of gas and its law** **Different types of bonds** **Define Acid, base and salt** **Describe Buffer solution, pH and its application** **State Different types of reaction and catalyst** **Calculate oxidation and reduction number** **Describe Hardness of water and its removing process** **Illustrate Electrolysis process** **State organic chemistry** **Describe Various type of hydrocarbon** **State Different types of alcohol** **Describe Aromatic compound and its use** **Explain Food security and processing**			
Learning Outcome (Practical)	**After undergoing the subject, students will be able to perform:** **Use laboratory equipment's and safety measure** **Perform Preparation of various strength of solution** **Calculate the strength of unknown solution** **Identify Nature of different type of solution** **Perform Qualitative analysis of radicals and salt** **Perform Preparation of vinegar and sanitizer**			

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	**ATOMIC STRUCTURE** 1.1 Define Element, atoms and molecules. 1.2 Define molecular mass, atomic number, mass number, mole and Aveogadro's number. 1.3 Distinguish between atom and molecule. 1.4 Describe Fundamental particle of atom. 1.5 Define isotope, isobar and isotone. 1.6 Define Orbit and Orbital. 1.7 Explain Quantum number. 1.8 Describe Electronic configuration based on Aufbau principle, Hunds rule and Paulis exclusion principle.	6	10
2	**SYMBOL, VALENCY AND FORMULA** 2.1 Define Symbol, Valency and formula. 2.2 Discuss the variations of valency. 2.3 Describe active and latent valency. 2.4 Describe Radicals.	3	6
3	**GAS** 3.1 Define gas and vapor. 3.2 Mention the Characteristic of gas. 3.3 Distinguish between gas and vapor. 3.4 Define STP, NTP and Absolute temperature. 3.5 Mention the Boyle's, Charle's and Avogadro's law. 3.6 Establish the ideal gas equation (PV=nRT)	4	7
4	**CHEMICAL BOND** 4.1 Define Chemical Bond. 4.2 Define Octet rule. 4.3 Explain Ionic bond, Covalent bond and Co-ordinate covalent bond. 4.4 Mention the Characteristic of ionic and covalent compound. 4.5 Differentiate between ionic and covalent compounds.	3	7
5	**ACID, BASE AND SALT** 5.1 State Modern concept of Acid and Base. 5.2 List the properties of acid and base. 5.3 Classify Salt 5.4 Explain Basicity of an acid and acidity of a base.	3	6
6	**IONIC EQUILIBRIUM** 6.1 Explain pH and pH scale. 6.2 Define Normality, Molarity and Molality. 6.3 Define Primary and Secondary Standard Substances. 6.4 Define Standard Solution, Titration and Indicator. 6.5 Define Buffer Solution and Its Mechanism. 6.6 Describe Importance of pH in Agriculture and Chemical Industries.	3	6

7	**CHEMICAL REACTION** 7.1 Define Exothermic and endothermic reaction. 7.2 Define Chemical Reaction 7.3 Classify Chemical Reaction. 7.3 Describe Catalyst and Catalysis. 7.5 Mention the uses of Catalyst in Industries.	**3**	**7**
8	**OXIDATION AND REDUCTION** 8.1 Describe Modern concept of Oxidation and Reduction. 8.2 Define Oxidizing agent and Reducing agent. 8.3 Describe Simultaneous process of Oxidation and Reduction. 8.4 Explain the Oxidation number / state. 8.5 Distinguish Between Oxidation number and Valency.	**3**	**6**
9	**WATER** 9.1 Define Hard and Soft water. 9.2 Define Hardness of water. 9.2 Describe permutit process to removal the hardness of water. 9.3 Mention the Advantage and disadvantage of Soft and Hard water. 9.4 Describe Reverse Osmosis process.	**3**	**6**
10	**ELECTRO-CHEMISTRY** 10.1 Define Electrolyte, Electrolysis and Electrode. 10.2 State the Mechanism of Electrolysis process. 10.3 Mention the Process of Chrome Electro-plating. 10.4 Define Galvanizing. 10.5 Mention the importance of Galvanizing.	**3**	**5**
11	**Basic concept of organic chemistry** 11.1 Define organic chemistry. 11.2 Classify organic compound 11.3 Mention the Catenation properties of Carbon 11.4 Distinguish between organic & inorganic compound 11.5 Explain homologous series of organic compound 11.6 State molecular & structural formula of methane, ethane, propane & butane. 11.7 Describe functional group of organic compounds	**3**	**6**
12	**Aliphatic Hydrocarbon** 12.1 Define hydrocarbon, saturated and unsaturated hydrocarbon 12.2 Describe nomenclature of alkane, alkene and alkyne IUPAC system. 12.3 Mention the uses of hydrocarbon methane, ethane and ethyne.	**3**	**4**
13	**Alcohol** 13.1 Define alcohol. 13.2 Describe the classification of alcohol. 3.3 Define absolute alcohol, rectified sprit and power alcohol. 4.4 Define enzyme and fermentation.	**3**	**4**
14	**Aromatic Compound** 14.1 Define aromatic compound. 14.2 Define aromaticity and Hackle's Theory. 14.3 Describe Synthesis Benzene from phenol, acetylene and benzoic acid. 14.4 Mention the uses of benzene.	**3**	**5**
15	**VOCATIONAL CHEMISTRY** 15.1 Define Food security, Natural and approved chemical preservatives.	**2**	**5**

	15.2 Describe canning process of Mango and Pineapple. 15.3 Describe canning process of Fish and Meat.		
	Total	**48**	**90**

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Marks (Continuous)
1	Safe Use of Laboratory and Familiar with instrument 1.1 Follow Laboratory Rules and OSH 1.2 Wear Apron, Safety Glass, Mask and Gloves. 1.3 Use of Conical flask, Wash bottle, Burette, Pipette 1.3 Use Flammable substance according to instruction 1.4 Importance of minimum use of chemical. 1.5 Use of Fast aid box. 1.6 Follow DO's or Don't in laboratory.	**2**	**2**
2	Perform Preparation of decimolar (0.1M) Na_2C0_3 Solution	**1**	**2**
3	Determine the strength of H_2SO_4 Solution by decimolar (0.1M)	**1**	**2**
4	Perform Preparation of decimolar (0.1M) NaOH Solution.	**1**	**2**
5	Determine the strength of Hydrochloric acid (HCl) Solution by decimolar (0.1M) NaOH Solution	**1**	**2**
6	Measure the pH value of unknown solution using pH meter and paper.	**1**	**3**
7	Identify Radicals: Cu^{2+}, Al^{3+}, Fe^{2+}, Fe^{3+}, Ca^{2+}, Zn^{2+}, NO_3^-, Cl^-, SO_4^{2--}, CO_3^{2-}	**3**	**3**
8	Identify salt: ($Cu(NO_3)_2$, $AlCl_3$, $FeSO_4$, $FeCl_3$, $CaCO_3$, $ZnCl_2$)	**4**	**4**
9	Perform Preparation of vinegar from Acetic acid	**1**	**2**
10	Perform Preparation of Sanitizer using Isopropyl Alcohol	**1**	**3**
	Total	**16**	**25**

Necessary Resources (Apparatus and equipment's):

Sl	Item Name	Quantity
01	Test tube, Test tube holder, Test tube Stand, Test tube brush, Bunsen burner , Cork borer, Spatula, Droper, Clamp	
02	Beaker, Conical flask, Round bottomed flask, Volumetric flask, Distillation flask , Pneumatic trough	
03	Porcelain basin, Crucible, Mortar and pastle	
04	Thistle funnel, Buchner funnel, Common funnel, Dropping funnel	
05	Woulfsbottle, Wash bottle, Reagent bottle,	
06	Retort, Gas gar, Gas chamber, War gauge, Watch glass, Capillary tube, Platinum wire, Copper wire,	

07	Tripod stand, Burette stand, Ring stand, Crucible tong, Gas generator/ Gas Cylinder	
08	Burette, Pipette, Measuring cylinder, Glass rod	
09	Digital balance, Analytical balance, Weight box, pH meter, pH paper, Litmus paper, Filter paper, Kipp's apparatus	
10	Safety glass, Gloves, Apron, Mask, Fire estighguser, First aid box	

Required Chemicals:

Sl	Item Name (Consumables Materials)	Quantity
01	Distilled water, Petrol, Grease etc	
02	Different type of acid : HCl, H_2SO_4, HNO_3, H_3PO_4, CH_3C00H etc.	
03	Different type of base such as NaOH, KOH, $Ca(OH)_2$, $Al(OH)_3$, NH_4OH, etc	
04	Different type of salt :[$Cu(NO_3)_2$, $AlCl_3$, $FeSO_4$, $FeCl_3$, $CaCO_3$, $ZnCl_2$, NH_4Cl etc]	
05	Different type of indicator	
06	Different type of reagent such as Potassium Ferro cyanide, Potassium iodide , Nessler's solution, Potassium pyroantimonate solution, Ammonium oxalate solution, etc	

Recommended Books:

Sl	Book Name	Writer Name	Publisher Name & Edition
01	Higher secondary chemistry	Dr. Sarozkantishinghahazari	Hasan book house
02	Higher secondary chemistry	Mahbub hasnlinkon	Akharpatro
03	Engineering chemistry	Uppal	Khanna publishers
04	Chemistry practical	Dr. Sarozkantishinghahazari	Hasan book house

Website References:

Sl	Web Link	Remarks
01	www. researchgate. net	

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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
26721	Electrical Circuit-I	T	P	C
		3	3	4

Rationale	Diploma in Engineering Level students are required to acquire the knowledge and skill on concept of Electrical Circuit Parameters, Network Theorem's, Single phase AC circuits. After completion of this course student will be able to operate the Oscilloscope; verify Kirchhoff's law, Thevenin's theorem, Norton's theorem, Superposition's theorem, Maximum power transfer theorem and Nodal theorem; Measure effective resistance of a coil and determine the value of resistance, inductance and capacitance of RL, RC, and RLC series circuit. As such the knowledge of Electrical Circuit-1 the pre-requisite for these fields for effective discharge of their duties. These necessities of Electrical Engineering subjects in the curriculum of Diploma in Engineering level. They will be able to verify and apply Kirchhoff's Law, Thevenin's Theorem, Norton's Theorem, Superposition's Theorem, Maxwell's Theorem, Maximum Power Transfer Theorem, Nodal theorem and measure the values of RL, RC, RLC Series circuit. Have been given more emphasis on practical aspect rather than theory in teaching learning approach.
Learning Outcome (Theoretical)	After Completing the subject, students will be able to: ▪ Describe Circuit parameters and Network Theorem ▪ Analyze Kirchhoff's Law, Thevenin's Theorem, Norton's Theorem, Superposition's Theorem, Maxwell's Theorem, Maximum Power Transfer Theorem, ▪ Outline Single phase AC circuits ▪ Recognize Principles of basic circuits ▪ Find the value of Impedance and voltage of RL, RC and RLC circuit ▪ Vectors diagram and Impedance triangle of RL, RC and RLC circuit ▪ Exercise the value of power and power factor of RL, RC and RLC circuit
Learning Outcome (Practical)	After undergoing the subject, students will be able to: ▪ Perform to operate the Oscilloscope ▪ Verify Kirchhoff's law, ▪ Verify Thevenin's theorem, Norton's theorem, Superposition's theorem, Maximum power transfer theorem and Nodal Theorem ▪ Measure the effective resistance of a coil ▪ Determine the value of resistance, inductance and Impedance of RL series circuit ▪ Calculate the value of resistance, capacitance and Impedance of RC series circuit ▪ Determine the value of resistance, inductance, capacitance and Impedance of RLC series circuit

Detailed Syllabus (Theory)

Unit	Topics with contents	Class (1Period)	Final Marks
1.	CIRCUIT PARAMETERS 1.1 Define direct current (DC). 1.2 Describe circuit parameters. 1.3 List the circuit parameters. 1.4 Explain circuit parameters with units.	2	2
2	ELECTRIC NETWORK 2.1 Define electric networks. 2.2 List the different types of electric networks. 2.3 Explain the different types of electric networks. 2.4 Describe active and passive network. 2.5 Define current source and voltage source. 2.6 Explain the current and voltage source in electric network. 2.7 Give examples of current source & voltage source.	2	4
3	NETWORK THEOREMS 3.1 State & explain Kirchhoff's current Law (KCL) and Kirchhoff's voltage Law (KVL). 3.2 Interpret Thevenin's theorem. 3.3 Illustrate Superposition theorem. 3.4 Analyze Norton's theorem. 3.5 Describe Maxwell's theorem. 3.6 State & explain Maximum power transfer theorem. 3.7 Solve problems related to all Theorems.	10	18
4	NODAL ANALYSIS 4.1 Define Nodal Theorem and Nodal equation. 4.2 Explain Nodal Theorem. 4.3 Mention the types of Nodal analysis 4.4 Describe methods of Nodal analysis. 4.5 List the advantages of Nodal analysis 4.6 Solve problems on Nodal analysis.	2	6
5	STAR-DELTA CONVERSION 5.1 State star-delta conversion.	3	8

	5.2 Explain star-delta conversion. 5.3 Convert star to delta connection and vice versa. 5.4 Solve problems related on star-delta conversion.		
6	**AC FUNDAMENTALS.** 6.1 Define AC circuit (AC). 6.2 Explain the importance of AC systems. 6.3 Describe the advantages and disadvantages of AC circuit. 6.4 Principle of the generation of AC voltage. 6.5 Derive the equation: $e = E_{max}Sin\omega t$ 6.6 Define cycle, frequency & time period with units. 6.7 Show the relation: $f = \frac{PN}{120}$ 6.8 List the commercial frequency of different countries. 6.9 Explain phase & phase difference with diagram. 6.10 Solve related problems.	3	8
7	**AC CIRCUITS QUANTITIES AND RMS VALUES.** 7.1 Define instantaneous value, average value, effective value and maximum values of alternating quantities. 7.2 Generalize the rms values. 7.3 Interpret form factor and peak factor. 7.4 Describe ohmic resistance & effective resistance. 7.5 Compare ohmic & effective resistance. 7.6 Solve problems on instantaneous, average and rms values.	2	4
8	**VECTOR AND VECTOR QUANTITIES.** 8.1 Define vector quantities. 8.2 Explain vector representation of alternating voltage and current. 8.3 Interpret vector in Polar form. 8.4 Describe vector in Rectangular form. 8.5 Formulate the relation between vectors expressed in rectangular and polar co-ordinate. 8.6 Solve problems relating to vector sum & difference, multiplication and division for all methods.	3	4
9	**COMPONENTS OF AC CIRCUIT**	4	6

	9.1 Sketch a circuit containing pure Resistance. 9.2 Explain the vector & phasor diagram of a pure resistive circuit. 9.3 Deduce the current and voltage relation in pure resistive circuit. 9.4 Sketch a circuit containing pure Inductance and formulate Inductive reactance. 9.5 Explain the vector & phasor diagram of pure Inductive circuit. 9.6 Evaluate the relation among inductive reactance, current and voltage in pure Inductive circuit. 9.7 Sketch a circuit containing pure Capacitance and formulate capacitive reactance. 9.8 Explain the vector & phasor diagram of pure capacitive circuit. 9.9 Simplify the relation among inductive reactance, current and voltage in pure Capacitive circuit		
10	**RL & RC SERIES CIRCUIT** 10.1 Draw circuit containing resistance and inductance (RL) in series. 10.2 Explain vector & phasor diagram in RL series circuit. 10.3 Formulate impedance, current and voltage drop in RL series circuit. 10.4 Draw impedance triangle for RL series circuit. 10.5 Draw circuit containing resistance and capacitance (RC) in series. 10.6 Explain vector & phasor diagram in RC series circuit. 10.7 Formulate impedance, current and voltage drop in RC series circuit. 10.8 Draw impedance triangle for RC series circuit. 10.9 Solve problems on RL & RC series circuits.	4	6
11	**AC SERIES CIRCUIT (CONTAINING RESISTANCE, INDUCTANCE AND CAPACITANCE).** 11.1 Sketch a circuit containing resistance, inductance and capacitance (RLC) in series. 11.2 Explain vector & phasor diagram of RLC series circuit. 11.3 Draw impedance triangle of RLC series circuit. 11.4 Calculate inductive reactance, capacitive reactance, impedance, current & voltage in RLC	3	8

	series circuit. 11.5 Solve problems on RLC series circuit.		
12	**POWER & POWER FACTOR FOR AC COMPONENT** 12.1 Define power, power factor, active & reactive power. 12.2 Determine power and power factor of pure resistive circuit. 12.3 Calculate power and power factor of pure Inductive circuit. 12.4 Calculate power and power factor of pure capacitive circuit. 12.5 Solve problems on power & power factor of different pure ac circuit.	3	4
13	**POWER & POWER FACTOR RL SERIES CIRCUIT** 13.1 Calculate power, power factor, active & reactive power of RL series circuit. 13.2 Draw and specify the components of Power triangle for RL series circuit 13.3 Calculate power, power factor, active & reactive power of RL series circuit. 13.4 Explain the power wave diagram of RL series circuit. 13.5 Solve problems on power & power factor in RL series circuit.	2	4
14	**POWER & POWER FACTOR RC SERIES CIRCUIT.** 14.1 Calculate power, power factor, active & reactive power of RC series circuit. 14.2 Draw and specify the components of Power triangle for RC series circuit 14.3 Calculate power, power factor, active & reactive power of RC series circuit. 14.4 Explain the power wave diagram of RC series circuit. 14.5 Solve problems on power & power factor in RC series circuit.	2	4
15	**POWER & POWER FACTOR RLC SERIES CIRCUIT** 15.1 Calculate power, power factor, active & reactive power of RLC series circuit. 15.2 Draw and specify the components of Power triangle for RLC series circuit 15.3 Calculate power, power factor, active & reactive	3	4

	power of RLC series circuit. 15.4 Explain the power wave diagram of R, L, C, RL, RC & RLC series circuit. 15.5 Solve problems on power & power factor of different series circuit.		
		48	90

Detailed Syllabus (Practical)

Sl.	Experiment name with procedure	Class (3 Period)	Continuous Marks
1	**OPERATE OSCILLOSCOPE TO MEASURE AC VOLTAGE & FREQUENCY.** 1.1 Select required tools and equipment the oscilloscope. 1.2 Identify the control & function knobs of oscilloscope 1.3 Set the function knobs of oscilloscope as instructed. 1.4 Identify the control & function knobs of a signal generator. 1.5 Set the function knobs as instructed 1.6 Check all connections. 1.7 Maintain the record of performed task.	1	1
2	**VERIFY KIRCHHOFF'S LAW.** 2.1 Draw the circuit diagram for KCL and KVL, 2.2 Collect required tools, equipment and necessary materials. 2.3 Construct the circuit for KCL and KVL. 2.4 Select the series section of the circuit. 2.5 Verify Kirchhoff's current law. 2.6 Select the parallel section of the circuit. 2.7 Compere the percentage difference of the theoretical value and the experimental value 2.8 Maintain the record of performed task.	2	2
3	**VERIFY THEVENIN'S THEOREM.** 3.1 Draw the circuit diagram for Thevenin's Theorem. 3.2 Collect necessary tools, equipment and	2	2

	circuit. 3.3 Construct the circuit as per diagram. 3.4 Measure open circuit voltage across the points. 3.5 Measure the equivalent resistance from the two points with appropriate condition. 3.6 Record Thevenin's voltage and resistance. 3.7 Compere the percentage difference of the theoretical value and the experimental value. 3.8 Maintain the record of performed task.		
4	**VERIFY NORTON'S THEOREM.** 4.1 Draw the circuit diagram for Norton's Theorem. 4.2 Collect tools, equipment and materials. 4.3 Construct the circuit as per diagram. 4.4 Mark the points for Norton's equivalence. 4.5 Measure short circuit current at the points. 4.6 Measure the equivalent resistance at the points with appropriate condition. 4.7 Compere the percentage difference of the theoretical value and the experimental value 4.8 Maintain the record of performed task.	1	2
5	**VERIFY SUPERPOSITION THEOREM.** 5.1 Draw the circuit diagram for Thevenin's Theorem. 5.2 Collect tools, equipment and materials. 5.3 Construct the circuit with at least two sources of power supply. 5.4 Select a branch for superposition and activate one source at a time making other sources short circuited. 5.5 Measure the current though the selected branch. 5.6 Repeat the steps with all the sources. 5.7 Add all the measured current algebraically for the selected branch. 5.8 Measure the current though the branch activating all the sources. 5.9 Compare the measured value with that of calculated value. 5.10 Maintain the record of performed task.	1	2
6	**VERIFY MAXIMUM POWER TRANSFER THEOREM.**	1	2

	6.1 Draw the circuit diagram for Maximum Power Transfer Theorem. 6.2 Collect tools, equipment and materials. 6.3 Connect the source according to circuit diagram. 6.4 Record and computing data. 6.5 Calculate the P_L (Load power) using $P_L=l_L^2 R_L$ equation. 6.6 Compere the percentage difference of the theoretical value and the experimental value. 6.7 Maintain the record of performed task.		
7	**VERIFY NODAL THEOREM.** 7.1 Draw the circuit diagram for Nodal Theorem. 7.2 Collect tools, equipment and materials. 7.3 Connect the source according to circuit diagram. 7.4 Record and computing data for Resistance R_1, R_2 & R_3. 7.5 Calculate the voltage and current 7.6 Compere the percentage difference of the theoretical value and the experimental value. 7.7 Maintain the record of performed task.	1	2
8	**MEASURE EFFECTIVE RESISTANCE OF A COLL.** 8.1 Draw the circuit diagram for determining the effective resistance. 8.2 Collect tools & equipment and necessary materials. 8.3 Correct the circuit according to the circuit diagram using proper equipment. 8.4 Check all connection points before actual operation. 8.5 Connect DC supply and record readings. 8.6 Calculate Ohmic resistance from the formula by recording relevant data: $R_{dc}=P_{dc}/I^2_{dc}$ 8.7 Determine effective resistance from the formula $R_{ac}=P_{ac}/I^2_{ac}$ 8.8 Compare the Ohmic resistance and effective	1	2

	resistance and find the ratio. 8.9 Maintain the record of performed task.		
9	**DETERMINE THE VALUES OF RESISTANCE & INDUCTANCE AND FOR RL SERIES CIRCUIT.** 9.1 Sketch the circuit diagram for determining resistance and inductance of a RL series circuit. 9.2 Collect tools, equipment and materials for the experiment. 9.3 Connect the circuit according to the circuit diagram using proper. 9.4 Check all connection points before actual operation. 9.5 Apply proper voltage & record readings from the meter. 9.6 Find the value of resistance & phase angle from relevant data. 9.7 Sketch the vector diagram with the relevant data as obtains. 9.8 Maintain the record of performed task.	1	2
10	**MEASURE THE VALUES OF RESISTANCE & CAPACITANCE for RC SERIES CIRCUIT.** 10.1 Sketch the circuit diagram for RC series circuit. 10.2 Collect tools, equipment and materials for the experiment. 10.3 Connect the circuit according to the circuit diagram using proper equipment. 10.4 Check all connection points before actual operation & apply the voltage and record the relevant readings. 10.5 Determine the value if resistance, capacitance & phase angle from recorded or relevant data. 10.6 Sketch the vector diagram with the help of relevant data as obtained. 10.7 Maintain the record of performed task	1	2
11	**DETERMINE THE VALUES OF RESISTANCE & INDUCTANCE** FOR **RLC SERIES CIRCUIT.** 11.1 Sketch the circuit diagram for RLC series circuit 11.2 List tools, equipment and materials and for	1	2

	the experiment. 11.3 Connect the circuit as per Ckt diagram equipment. 11.4 Check all connection points before actual operation. 11.5 Apply proper power supply to the circuit and record the readings from the meter. 11.6 Determine the values of resistance, inductance, capacitance and phase angle from the relevant data. 11.7 Verify the supply voltage is equal to the vector sum of voltage drop in each parameter. 11.8 Sketch the vector diagram with the help of relevant data as obtained. 11.9 Maintain the record of performed task.		
12	**DETERMINE POWER AND POWER FACTOR OF A RL SERIES CIRCUIT** 12.1 Sketch the circuit diagram for RLC series circu 12.2 Collect tools, equipment and materials for the experiment 12.3 Connect the circuit according to the circuit diagram using proper equipment. 12.4 Check all connection point before actual operation. 12.5 Supply power to the circuit and record the readings from the meter. 12.6 Determine the value of phase angle and power factor from the relevant data. 12.7 Sketch the vector diagram with the relevant data. 12.8 Maintain the record of performed task.	**3**	**4**
	Total	**16**	**25**

Necessary Resources (Tools, equipment's, Materials and Machineries):

Sl	ITEM NAME	QUANTITY
01	Screw drivers, Neon tester, Electrician knife	Each item 25 no's
02	Ammeter, Voltmeter, Ohm meter, AVO meter, Wattmeter, Frequency meter, Power factor meter,	Each item 10 no's
03	Resistor, Inductor, Capacitor	Each item 25 no's
04	Different types of Wires and Cables (1.0 to 3.5rm	5 coils of different sizes
05	Two pin socket, Tree pin socket, Combined switch and socket, two pin plug, three pin Plug,	Each item 10 no's

06	Dc power supply unit, Voltage stabilizer, single phase and three phase variac	Each item 10 no's
07	Oscilloscope, Signal generator	Each item 10 no's
08	Dry cells (1.5v, 2.2v, 3.0v, 6.0v, 9.0v), Graph papers	Each item 10 no's

Recommended Books:

Sl	BOOK NAME	WRITER NAME	PUBLISHER NAME & EDITION
01	Electrical Circuits and Networks	Monica Mehrotra, Deepak Balody	October' 2020, Tata Mcgrohill
02	Fundamentals of Electric Circuits	Charles k. Alexand er & Matthew Sadiku	February'2019
03	A text book of Electrical Technology	B. L. Theraja	S.Chand, 2021
04	Electrical Circuits	B. H. Deshmukh	Nirali Prakashan, Feb, 2021
05	Schaum's Outline of Electric Circuit	Joseph A Edminister and Mahmood Nahvi	McGraw-Hill, Fourth Edition.

Website References:

Sl	Web Link	Remarks
01	http//www.electricalengineering.org	--
02	http//www.electrical-installation.org	--
03	http//www.eetiimes.eu	--
04	http//www.interestingengineering .com	--
05	http//www.electrical-engineering-portal.com	--
06	http//www.electrical4u.com	--

Subject Code	Subject Name	Period per Week		Credit
26821	**Electronic Devices and Circuits**	T	P	C
		3	3	4

Rationale	Diploma in Engineering Level students are required to acquire the knowledge and skill on concept of Transistor power amplifier, JFET and MOSFET. Oscillator, different Multivibrators, SCR, Controlled Rectifier, Wave shaping circuits, ICs (integrated circuits), Operational amplifier and Voltage regulator circuits. After completing this course student will be able to construct and demonstrate different types of Amplifier, Multivibrator, Controlled Rectifier, voltage regulator and Oscillator which are used in about all electronic system.
Learning Outcome (Theoretical)	After Completing the subject, students will be able to: • Classify various types power amplifier, JFET, MOSFET, Oscillator, UJT,SCR TRIAC,DIAC, Multivibrator Controlled Rectifier, ICs, voltage regulator, • Compare MOSFET and JFET • Mention the application of JFET and MOSFET • Describe power amplifier, Tank Circuit , Oscillator, • Describe feedback amplifier • State wave shaping circuit, Controlled Rectifier, operational amplifier.
Learning Outcome (Practical)	**After undergoing the subject, students will be able to:** • **Verify the characteristics of JFET.** • **Demonstrate the operation of a Hartly and Colpitt Oscillator and different types of Multivibrator.** • Verify input and output wave shape of a single phase-controlled rectifier differentiating, integrating Clipping and Clamping circuit. • Construct a Illumination Circuit, fixed variable voltage regulator circuit using voltage regulator IC.

Detailed Syllabus (Theory)

Unit	Topics with Contents	Class (1 Period)	Final Marks
1	**TRANSISTOR MODEL AND EQUIVALENT CIRCUITS.** 1.1 Define Transistor Model and H- Parameter. 1.2 Describe the transistor as a four terminal device. 1.3 Mention the notation for currents and voltages of transistor amplifier. 1.4 Describe the low frequency small signal model (AC Equivalent) of transistor. 1.5 Describe the H-Parameter model of a linear four terminal network. 1.6 Derive formula for current gain, voltage gain, input impedance, and output impedance of CE transistor amplifier by H-Parameters. 1.7 Solve problem for transistor amplifier using H-Parameters.	3	5
2	**POWER AMPLIFIER.** 2.1 Define class A, B, AB and C amplifier. 2.2 Differentiate between voltage and power amplifier. 2.3 Explain the circuit operation and efficiency of RC and transformers coupled class-A power amplifier. 2.4 Explain the operation and efficiency of class-B and push-pull amplifier. 2.5 Describe the operation of complementary symmetry push-pull. Amplifier Explain the operation, efficiency and distortion of class-C amplifier. 2.6 Explain the operation and frequency response of various tuned amplifier 2.7 Describe the advantages, disadvantages various types of power amplifier. 2.8 Describe the application of the various types of power amplifier. 2.9 Solve problem related to Q-point and efficiency.	4	8
3	**FIELD-EFFECT TRANSISTOR (FET).** 3.1 Define field effect transistor. 3.2 Mention the types of FET 3.3 Describe the construction and operation of Junction Field Effect Transistor (JFET). 3.4 Explain characteristics of JFET. 3.5 Describe the parameters of JFET. 3.6 Establish the relationship among FET parameters. 3.7 Describe the DC biasing of JFET and its load line. 3.8 Explain the operation of CS, CD and CG JFET amplifiers. 3.9 Solve problems based on FET parameters.	3	8
4	**METAL OXIDE SEMICONDUCTOR FET (MOSFET).** 4.1 Define MOSFET. 4.2 Describe the Construction and operation of DE and E-Only MOSFET. 4.3 Explain the characteristics of DE and E-Only MOSFET. 4.4 Compare between BJT and FET. 4.5 Compare between MOSFET and JFET. 4.6 Mention the application of JFET and MOSFET in analog and digital circuits.	3	5
5	**FEEDBACK AMPLIFIER.** 9.1 Define feedback 9.2 List the types of feedback. 9.3 Describe different types of feedback with block diagram. 9.4 Calculate the gain of amplifier with feedback (positive and negative). 9.5 Describe the effect of positive and negative feedback. 9.6 Mention the advantages and disadvantages of negative feedback in amplifier.	2	3
6	**SINUSOIDAL OSCILLATORS.** 6.1 Define Oscillator.	3	8

	6.2 List the types of Oscillator. 6.3 Explain the principle of operation of an oscillatory tank circuit. 6.4 Describe the essentials of feedback LC oscillators. 6.5 Explain the principle of operation of tuned collector, tuned base and tuned drain oscillators. 6.6 Explain the principle of operation of Hartly, Colpitt and Wein-bridge oscillators. 6.7 Explain the principle of operation of phase shift & crystal oscillators. 6.8 Solve problem related to the frequency of various oscillators.		
7	**MULTIVIBRATOR CIRCUITS.** 7.1 Define time base circuit. 7.2 Mention the methods of generating time base waveform. 7.3 Explain the generation of saw-tooth wave using charging and discharging of a capacitor. 7.4 Mention the features of Multivibrator circuits. 7.5 State Multivibrator. 7.6 Explain the operation of stable, Monostable and Bistable Multivibrator cir with wave shapes. 7.7 Mention the principle of operation of Schmitt trigger circuit.	**4**	**5**
8	**UNIJUNCTION TRANSISTOR (UJT) AND PROGRAMMABLE UNIJUNCTION TRANSISTOR (PUT)** 8.1 Describe the structure and operation of UJT and PUT 8.2 Draw equivalent circuit of UJT. 8.3 Define stand-off ratio. 8.4 State how to set the trigger voltage of PUT. 8.5 Difference between PUT and UJT. 8.6 Analyze the operation relaxation oscillator using UJT and PUT. 8.7 Solve problem related to Pinch-off voltage and stand-off ratio	**3**	**5**
9	**SILICON CONTROL RECTIFIER (SCR)** 9.1 Define Thyristors. 9.2 Mention the types of Thyristors. 9.3 Describe the construction and operation of SCR. 9.4 Describe the V-I characteristics of SCR. 9.5 Explain the operation of SCR using two-transistor Equivalent circuit. 9.6 Derive the equation for anode current. 9.7 Explain how to turn an SCR on and off. 9.8 Explain the operation of automatic battery charger, emergency lighting, heater control, and over voltage protection circuits. 9.9 Describe the construction and operation of light activated SCR (LASCR).	**3**	**8**
10	**CONTROLLED RECTIFIER.** 10.1 Define Controlled Rectifier. 10.2 Mention the types of control rectifier. 10.3 Describe the operation of half wave controlled rectifier using SCR for resistive and inductive load with wave shapes. 10.4 Analyze the operation of single-phase full-wave mid-point controlled rectifier, Half controlled and full controlled bridge rectifier with wave shapes. 10.5 Explain the effect of freewheeling diode in rectifier circuit with inductive load. 10.6 Describe the operation of poly-phase controlled rectifier. 10.7 Mention the operation of Illumination circuit and Speed control	**4**	**8**

	of dc and ac motors.		
11	**DIAC AND TRIAC** 11.1 Describe the structure and operation of DIAC. 11.2 Explain the V-I characteristics curve of DIAC. 11.3 Describe the structure of TRIAC. 11.4 Discuss the SCR equivalent circuit of TRIAC. 11.5 Explain the triggering modes of TRIAC. 11.6 Describe the characteristics curve of TRIAC. 11.7 State the commutation of TRIAC. 11.8 Analyze the operation of TRIAC firing circuits . 11.9 Analyze the operation of a TRIAC phase control, lamp dimmer and Heat control circuit.	**3**	**5**
12	**WAVE SHAPING CIRCUITS.** 12.1 Mention the types of wave shaping circuit. 12.2 Describe charging and discharging of RC and RL circuits. 12.3 Derive the charging and discharging equation of RC and RL circuit. 12.4 Analyze the charging and discharging time constant of RC and RL circuit. 12.5 Discuss the principles of RC and RL differentiating and integrating circuits. 12.6 Analyze the output waves for various input wave shapes of differentiating and integrating circuit. 12.7 Explain the operation of various clippers by PN junction diode, zener diode and transistor. 12.8 Describe the operation of diode clamping circuit for different input wave shape. 12.9 Solve problem related to time constant and wave shaping circuits.	**5**	**8**
13	**INTEGRATED CIRCUIT (IC).** 13.1 Define IC. 13.2 List the advantages and limitation of IC's. 13.3 Mention the scale of integration. 13.4 Mention the types of integrated circuits. 13.5 Describe the fabrication monolithic integrated circuits. 13.6 Describe the fabrication of integrated circuit components resistor, capacitor Transistor.	**2**	**4**
14	**OPERATIONAL AMPLIFIER (OP-AMP)** 14.1 Define operational amplifier. 14.2 Draw Op-Amp symbol. 14.3 State the basic principle of Op-Amp. 14.4 State the golden rule and virtual ground of Op-Amp. 14.5 List the characteristics of an ideal Op-Amp. 14.6 State the input& output impedance, offset voltage, input bias current, offset current, common-mode input voltage range, open-loop voltage gain, common-mode rejection ratio, slew rate, frequency response and unity-gain band width. 14.7 Explain the operation of Op-Amp in inverter, scale changer, unity follower, comparator, phase shifter, adder, subtractor, differentiator, integrator, ramp generator. 14.8 Describe the operation of Wien bridge Oscillator circuit using OP-Amp	**4**	**5**
15	**VOLTAGE REGULATORS.**	**2**	**5**

	15.1 Define voltage regulator. 15.2 Discuss line and load regulation. 15.3 Mention the block representation of three-terminal voltage regulator. 15.4 Describe the 78xx series of fixed positive voltage regulators. 15.5 Describe the 79xx series of fixed negative voltage regulators. 15.6 Describe the LM317 adjustable positive regulator. 15.7 Describe the LM 337 adjustable negative regulator. 15.8 Mention the voltage-regulator specifications.		
	Total	**48**	**90**

Detailed Syllabus (Practical)

Unit	Experiment name with procedure	Class (3 Period)	Continious Marks
1	**DEMONSTRATE THE OPERATION OF A TRANSISTOR CLASS-B PUSH PULL AMPLIFIER.** 1.1 Select an appropriate circuit diagram. 1.2 Select required tools, equipment and materials. 1.3 Make the circuit connection according to the given diagram. 1.4 Energize the circuit. 1.5 Observe the output wave and calculate the power gain. 1.6 Maintain the record of performed job.	**1**	**2**
2	**DEVELOP CHARACTERISTICS OF JFET IN COMMON SOURCE MODE.** 2.1 Select a circuit diagram. 2.2 Select required tools, equipment and materials. 2.3 Make all the connections according to the circuit diagram. 2.4 Check the circuit. 2.5 Record required data. 2.6 Plot input and output characteristic curves. 2.7 Maintain the record of performed job.	**2**	**3**
3	**DEMONSTRATE THE OPERATION OF A HARTLY AND COLPITT OSCILLATOR.** 3.1 Draw the circuit diagram. 3.2 Select tools, equipment and materials. 3.3 Connect the circuit diagram. 3.4 Check and energize the circuit. 3.5 Observe the output for different frequencies. 3.6 Maintain the record of performed job.	**2**	**2**
4	**DEMONSTRATE THE OPERATION OF A TRANSISTOR (ASTABLE, MONOSTABLE & BI-AST MULTIVIBRATOR) CIRCUIT.** **4.1** Sketch an experiment circuit**.** 4.2 Select the required tools and materials. 4.3 Build up the circuit as per diagram. 4.4 Switch on the power supply. 4.5 Switch on the trigger signal. 4.6 Observe the wave shapes at each collector & base of the transistor 4.7 Maintain the record of performed job.	**2**	**3**
5	**OBSERVE THE INPUT AND OUTPUT WAVE SHAPE OF A SINGLE PHASE CONTROLLED RECTIFIER USING SCR**. 5.1 Select an appropriate experiment circuit. 5.2 Select required tools, equipment and materials. 5.3 Connect the circuit as per diagram with Oscilloscope. 5.4 Check the connection and switch on the power supply.	**1**	**2**

	5.5 Observe the wave shapes at relevant points of the circuit. 5.6 Maintain the record of performed job.		
6	**CONSTRUCT A ILLUMINATION CIRCUIT USING DIAC AND TRIAC.** 6.1 Select an appropriate experiment circuit. 6.2 Select required tools, equipment and materials. 6.3 Connect the circuit as per diagram. 6.4 Check the connection and switch on the power supply. 6.5 Adjust the POT and observe the Illumination. 6.6 Maintain the record of performed job.	**2**	**3**
7	**OBSERVE THE INPUT AND OUTPUT WAVE SHAPE OF A RC DIFFERENTIATING AND INTEGRATING CIRCUIT.** 7.1 Select a RC differentiating circuit. 7.2 Select required materials, tools and equipment. 7.3 Connect the circuit as per diagram with CRO. 7.4 Switch on the power supply. 7.5 Adjust the signal frequency for the differentiating circuit. 7.6 Observe the output wave for different input wave shape on CRO screen.	**1**	**2**
8	**OBSERVE THE INPUT AND OUTPUT WAVE SHAPE OF CLIPPING AND CLAMPING CIRCU**IT. 8.1 Select a required circuit. 8.2 Select the associate equipment and materials. 8.3 Buildup the circuit for required wave shapes. 8.4 Switch on the power supply. 8.5 Observe the output on CRO screen.	**2**	**3**
9	**CONSTRUCT INVERTING AMPLIFIER , NON-INVERTING, ADDER, COMPARATOR, BUFFER AND SUBTRACTOR USING OP-AMP IC.** 9.1 Select a required circuit. 9.2 Select the associate equipment and materials. 9.3 Buildup the circuit as per function. 9.4 Switch on the power supply. 9.5 Observe the input and output wave shape on CRO screen. 9.6 Maintain the record of performed job.	**1**	**2**
10	**CONSTRUCT FIXED VARIABLE VOLTAGE REGULATOR CIRCUIT USING VOLTAGE REGULATOR IC.** 10.1 Select required circuit. 10.2 Select required equipment and materials. 10.3 Buildup the circuit. 10.4 Switch on the power supply. 10.5 Observe the output voltage for varying input voltage and load current.	**2**	**3**
	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), Input and output	**10 Nos**

	transformer.	
3	Diode, Resistor, Potentiometer, Inductor, Capacitor, General purpose small signal NPN and PNP Transistor, LED, Zener Diode, JFET, MOISFET, SCR, DIAC, TRIAC, UJT, PUT, 7805, 78012, LM317, LM337, 741 Op-Amp.	**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	A Text Book of Applied Electronics	R. S. Sedha	Chand
2	Power Electronics	Dr. P.S. Bimbhra	Chand
3	Principles of Electronics	V. K. Metha	Chand
4	Basic Electronics (Solid State)	B. L. Theraja	Chand

Website References:

Sl. No.	b 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**	**--**