Secondary Level School Curriculum

(Technical and Vocational Stream)

(Grade 9 - 10)

Computer Engineering

2078

Government of Nepal
Ministry of Education
Curriculum Development Centre
Sanothimi, Bhaktapur

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Preface

Secondary Level Education in Nepal aims to produce skillful healthy citizens familiar with national customs, culture, social heritage and democratic values who can actively take part in the economic development of the country. So, the main aim of this level is to produce skilled manpower who can make special contribution to the country's all-round development, and at the same time, to produce conscious citizens with essential knowledge and skills to be ready for university education. The process of developing and revising school level curricula in Nepal is being continued in line with this objective.

In this connection, in order to bring relevant changes in secondary level curricula as per the recommendations of School Sector Development Plan (SSDP), some subjects, i. e. Plant Science, Animal Science, Computer Engineering, Electrical Engineering and Civil Engineering have been introduced under Technical and Vocational stream. According to this provision, the curricula of these subjects have been prepared, and they are being implemented. Considering the situation that the curricula of these subjects are not easily available at present, they have been published for the wider circulation. This curriculum, revised in 2078 B. S., is one of them.

Revising school level curricula is a continuous process and the role of teachers, parents and scholars is vital in making it more effectivein future. Therefore, the Curriculum Development Centre always anticipates constructive suggestions from all the persons concerned.

Curriculum Development Centre

Sanothimi, Bhaktapur

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Class 9-10

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Grade Nine
Programming Principles and Concept in C Language

Grade: 9 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Programming is the fundamental concept that is most prevalent in present informative society. Programming is the backbone of all the electronics devices, web services and other devices we use in day-to-day activities. The overall development of Programming has helped us to perform our day-to-day actions accurately and in fraction of times. We wonder how it works, the control mechanisms of various devices, interrelation between many components of a single devices, the era of wonder has been achieved by programming. Yes, programming has been an invisible actor in present context which is present everywhere and its usage is increasing day by day with advancement of technology. For advanced learning and basic requirement in job market programming knowledge is mandatory. So, Government of Nepal has realized its importance, necessity and effectiveness so it has development this curriculum in accordance to the National Curriculum framework 2076. The study of this course will help students to learn about the programming technologies.

The curriculum aims to help the students with the fundamental concept of programming with C. The curriculum comprises of Introduction to programming where the basic apprehension of programming is presented, in second unit fundamentals of C where basic knowledge of C is presented, in third unit control flow statements where the flow controlling mechanism is presented moreover in other unit's functions of C, arrays in C, Strings in C, structure and unions in C and pointers in C. The course is combination of theory and practical and pedagogical approaches in delivering the course should consider in balance between theory and practical. The same methodology applies in case of student evaluation procedure too.

The curriculum has been offered as per the structure of National Curriculum Framework 2076. It provides a comprehensive outline of level-wise competencies, grade-wise leaning outcomes and scope and sequence of contents, suggested practical/project

activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematic.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the basic concept of programming, its domain and design tools
2. Elaborate basic concepts of C Language
3. Demonstrate necessity of control flow statements and order of execution of statement
4. Illustrate the functions and its types
5. Describe the importance of Array and Strings
6. Demonstrate Structure and Union and compare their features
7. Elaborate the usage of pointers and its necessity

3. Grade wise Learning Outcomes

S.N	Content Area	Learning Outcomes
1	Principles of programming	1.1 Illustrate the terms program, programmer, programming language and software. 1.2 Describe the categories of programming language. 1.3 Elaborate the programming dimension such as scientific application, business application. 1.4 Explain the program design tools (algorithm and flowchart).
2	Fundamentals of C	2.1 Introduce C programming, features of C programming and applications of c programming. 2.2 Demonstrate the program structure and syntax with terms preprocessor directive, Header files, Tokens, semicolons comments, Identifiers, Whitespace, Escape sequence). 2.3 Describe the variables and keywords of C programming. 2.4 Elaborate the character's sets, constants and variables.

		2.5 Illustrate the data types and format specifies. 2.6 Describe Input/output statements of C. 2.7 Describe the operators in C such as (Arithmetic operator, Relational Operator, Logical operator, Bitwise operator, Assignment operator).
3	Control Flow Statements	3.1 Introduce the decision-making statements. 3.2 Demonstrate the if, if else,else if…else statement and switch statement and their conditions. 3.3 Describe the loop statements with its necessity. 3.4 Demonstrate the for loop, while loop and Do-while loop statement and Nested loop statement with its conditions. 3.5 Illustrate jump statement. 3.6 Demonstrate the break, continue, goto and return statement with its conditions.
4	Functions	4.1 Introduce the concept of function in C and its features and advantages. 4.2 Demonstrate the declaration of a function, defining of a function. 4.3 and the calling of a function. 4.4 Discuss different types of functions. 4.5 Explain Library function vs User Defined function. 4.6 Introduce the function call (Call by value , Call by reference). 4.7 Describe the concept of recursive functions.
5	Arrays & Strings	5.1 Introduce the concept of Arrays& Strings in C. 5.2 Describe the features of arrays. 5.3 Elaborate One dimensional Array. 5.4 Demonstrate the usage of gets() and puts() functions. 5.5 Demonstrate the usage of string functions strlen() , strcpy(), strcat(), strcmp(),strrev(), strlwr(), strupr().

6	Structure and Union	6.1 Introduce the concept of structure & union and their features. 6.2 Demonstrate the declaration of structure and structure variable. 6.3 Elaborate the member access of structure& union. 6.4 Demonstrate the declaration of union and union variable. 6.5 Differentiate between structure and union.
7	Pointers	7.1 Introduce the concept of pointer, its features and advantages. 7.2 Demonstrate the declaration of pointer and pointer variable. 7.3 Describe the concept of Referencing and Dereferencing.

4. Scope and sequence

Theory

Unit	Scope	Content	Hrs.
1	Principles of Programming	1.1 Introduction to Programming (Program, Programmer, Programming Language, Software) 1.2 Categories of Programming Language 1.3 Applications 1.3.1 Scientific Application 1.3.2 Business Application 1.4 Program Design Tools (Algorithm and Flowchart)	6
2	Fundamentals of C	2.1 Introduction to C Programming 2.2 Basic Program Structure (Preprocessor Directive, Header Files, Tokens, Semicolons, Comments, Identifiers,	10

		Whitespace, Escape Sequence) 2.3 Variables and Keywords 2.4 Character Sets, Constants and Variables 2.5 Data Types and Format Specifiers 2.6 Input/ Output statements 2.7 Operators in C (Arithmetic Operator, Relational Operator, Logical Operator, Bitwise Operator, Assignment Operator)	
3	Control Flow Statements	3.1 Decision Making Statements 3.1.1 If Statement 3.1.2 If…else Statement 3.1.3 Switch Statement 3.2 Loop Statements 3.2.1 For Loop Statement 3.2.2 While Loop Statement 3.2.3 Do-While Loop Statement 3.2.4 Nested Loops Statement 3.3 Jump Statement 3.3.1 Break statement 3.3.2 Continue statement 3.3.3 Goto statement 3.3.4 Return statement	16
4	Functions	4.1 Introduction to Function 4.2 Functional Aspects 4.2.1 Declaration of Function 4.2.2 Definition of Function 4.2.3 Calling of Function 4.3 Types of Functions 4.3.1 Library Function 4.3.2 User-Defined Function	12

		4.4 Types of Function Call 4.4.1 Call by Value 4.4.2 Call by Reference 4.5 Concept of Recursive Functions 4.6 Advantages of Functions	
5	Arrays & Strings	5.1 Introduction to Array & String 5.2 Declaration and Initialization of Array 5.3 Introduction to One-Dimensional Array 5.4 Declaration of String 5.5 String Functions (strlen(), strcpy(), strcat(), strcmp(), strrev(),strlwr(), strupr())	10
6	Structure and Union	6.1Introduction to Structure 6.2Declaration of Structure and Structure Variable 6.3Accessing Member of Structure 6.4Introduction to Union 6.5Declaration of Union and Union Variable 6.6Accessing Member of Union	6
7	Pointers	7.1 Introduction to Pointer 7.2 Declaring Pointer and Pointer Variable 7.3 Referencing and Dereferencing 7.4 Advantages of Pointer	4
		Total	64

5. Suggested Practical and Project Works

Practical and project work is an integral part of technical and vocational subjects. They are carried out to consolidate the practical learning experiences. Some of the suggested practical and project work activities are mentioned below. As these are the basic and fundamental practical and project works, the teacher can adapt or introduce more relevant to their context and students' needs.

Unit	Grade 11		
	Scope	**Practical Activities**	**Hrs.**
1	Principles of programming	Familiarization with Programming IDE TOOLS (Visual Studio, DEV C++, Sublime text, Atom)	2
2	Fundamentals of C	Write a program to display "HELLO WORLD! "	3
3	Control Flow Statements	1. Write programs to implement sequential structure. 2. Write programs to implement conditional and iterative structure	15
4	Functions	1. Write programs using function. 2. Write a simple program to familiarize recursive function	15
5	Arrays &Strings	1. Write programs using arrays (sorting of list) 2. Write programs using strings	15
6	Structure and Union	1. Write programs using structure and union	7
7	Pointers	1. Write programs using pointer (*, &)	7
	Total		**64**

6. Learning Facilitation Process

This course intends to provide both theoretical as well as practical knowledge and skills on the subject, thereby, blends with both theoretical and practical facilitation strategies to ensure better learning. In fulfilling the learning outcomes stated in the curriculum, the teacher should use a variety of methods and techniques that fit to the contents. In particular, the following methods, techniques and strategies are used for learning facilitation:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction
- Question answer
- Demonstrations
- Online based instructions

- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 9 **Time : 2 hrs.**

Subjects : Programming Principles and Concept in C Language

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Principles of Programming	6	4	2	1	1	1	1	4	2	0	9	5	2	16	9	25	16	5
2	Fundamentals of C	10																	7
3	Control Flow Statements	16																	13
4	Functions	12																	10
5	Arrays & Strings	10																	8
6	Structure and Union	6																	5
7	Pointers	4																	2
	Total	64	4	2	1	1	1	1	4	2	0	9	5	2	16	9	25	16	50

Fundamentals of Computer and Application

Grade: 9 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Technology has evolved with the speed of light, and its speed of advanced is reaching peak day by day with new improvements and inventions. The human based activities have been translated into computer-based activities and the phase is still on. The development of Artificial Intelligence, robotics and Nano-Technology has surpassed all the expectations on this field. And with advancement of Technology computer knowledge has been a basic skill for any type of employment activities. Government of Nepal has realized its necessity, its effectiveness and developed the curriculum according to the national curriculum framework 2076. The study of this course will help students to maximize their knowledge to technology with basic Office skills and help them succeed in their professional life.

The curriculum aims to help the students on basic knowledge on basic concept of computer with must know concepts. The curriculum comprises of Introduction to computer, computer software, operating system, memory system, email and internet, multimedia and office package. The course is of practical nature and pedagogical approaches in delivering the course should consider the balance between theory and practical. The same methodology applies in case of student evaluation procedure too.

The curriculum is structured in accordance with National Curriculum Framework, 2076. It focuses on both theoretical and practical aspects having equal teaching and practical. It incorporates the level-wise competencies, grade-wise leaning outcomes, scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematically.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the concept of computer, its characteristics, application, classification and components.

2. Describe the concept of Computer software, its types and features
3. Develop the concept of memory its types, characteristics and uses
4. Elaborate the Operating System, its functions, types and features
5. Use Internet and its components
6. Develop the concept of multimedia, its components and applications
7. Demonstrate the emerging technology with basic uses and features

3. Grade wise Learning Outcomes

SN	Content Area	Learning outcomes
1	Introduction to computer	1.1 Introduce the computer, its characteristics and applications. 1.2 Classify the computer on basis of size, purpose, data type, model.
2	Computer Components	2.1 Describe the components of computers: input unit, output unit,memory unit and processing unit. 2.2 Describe Input Devices – Keyboard, Mouse, Joystick, OMR, OCR, BCR, MICR, Scanner, Touch Screen, Touchpad, Microphone and Digital Camera. 2.3 Describe Soft copy Output Devices: Monitors (LCD, LED/Plasma), Speaker, Projector and Headphone. 2.4 Describe Hardcopy Output devices: Printer (impact, non-impact and 3D Printer) and Graphic plotter. 2.5 Illustrate about concept of Memory Unit. 2.6 Describe Microprocessor: basic concepts, clock speed, word length, components and functions.
3	Computer software	3.1 Introduce Computer software its types and features. 3.2 Differentiate between system software and application software. 3.3 Describe the features and uses of system software with real world examples. 3.4 Describe the features and uses of applications of

		application software with real world examples. 3.5 Introduce the Operating System, its types and necessities. 3.6 Elaborate the functions and characteristics of Operating System. 3.7 Classify and describe the types of Operating System i.e. open source and closed source with its features. 3.8 Know about User interface (CUI and GUI). 3.9 Describe about OSS and proprietary software.
4	Memory/Storage Unit	4.1 Introduce the term memory and its necessity in computer. 4.2 Explain the types of memory. 4.3 Describe Cache memory, its features and uses in computer. 4.4 Describe primary memory, its features and uses in Computer. 4.5 Describe secondary memory, its features and uses in computer. 4.6 Distinguish between advantages and disadvantages of cache memory. 4.7 Elaborate the types and characteristics of primary memory (RAM (SRAM and DRAM) and ROM (PROM, EPROM, EEPROM)). 4.8 Elaborate the types and characteristics of Secondary memory (Magnetic storage (Hard disk, SSD), Optical storage (CD/DVD, Blue ray disk) and Flash memory (Pen-drive).
5	Internet and its Application	5.1 Introduce the Internet and its history. 5.2 Elaborate the advantages and disadvantages of Internet. 5.3 Describe about Requirements for Internet connection.

		5.4 Describe about Application of Internet (WWW (World Wide Web), E-mail (Electronic mail), Newsgroup, Telnet, Remote control, IRC (Internet Relay Chat), E-commerce, Search engine and E-Governance.
6	Multimedia	6.1 Introduce the multimedia and its necessity in present world. 6.2 Describe the components of Multimedia such as text, audio, video, image, animation. 6.3 Describe and demonstrate the applications of multimedia.
7	Emerging Technology	7.1 Introduction to Emerging Technology. 7.2 Concept of AI, Cloud Computing/ distributed computing, IOT, Big data, Data mining/data warehouse and Cryptography (Encryption and Decryption) its features, uses and basic applications. 7.3 Demonstrate VR, its features, uses and basic applications. 7.4 Demonstrate AR (Augmented Reality), its features, uses and basic applications.

4. scope and sequence

Unit	Scope	Content	Hrs.
1	Introduction to computer	1.1 Introduction to computer 1.2Characteristics of computer 1.3Modern Applications of computer 1.4Classification of computers: 1.4.1 on the basis of size, 1.4.2 on the data handling, 1.4.3 on the purpose and 1.4.4 on the model 1.4.5 on the brand	8

2	Computer Components	2.1 Introduction to Components of computer 2.2 Input Unit Input Devices – Keyboard, Mouse, Joystick, OMR, OCR, BCR, MICR, Scanner, Touch Screen, Touchpad, Microphone and Digital Camera. 2.3 Output unit Soft copy Output Devices: Monitors (CRT, LCD, LED/Plasma), Speaker, Projector and Headphone. Hardcopy Output devices: Printer (impact, non-impact and 3D Printer) and Graphic plotter. 2.4 Concept of Memory unit 2.5 Processing unit Microprocessor: basic concepts, clock speed, word length, components and functions	10
3	Computer software	3.1Introduction to Computer software 3.2 Types of software and its features 3.3 Introduction to Operating System 3.4 Functions and characteristics of Operating System 3.5 Types of Operating System 3.6 User interface CUI GUI 3.7 OSS (Open Source Software)	10
4	Memory/Storage Unit	4.1 Memory Definition 4.2 Types of Memory 4.3 Cache Memory 4.4 Primary / Main memory 4.4.1 Characteristics of Main/Primary memory,	10

		4.4.2 Types of Main/Primary memory-RAM (SRAM and DRAM) and ROM (PROM, EPROM, EEPROM) 4.5 Secondary Memory 4.5.1 Characteristics of Secondary Memory, 4.5.2 Types of Secondary Memory(Magnetic storage (Hard disk, SSD), Optical storage (CD/DVD, Blue ray disk) and Flash memory (Pen-drive))	
5	Internet and its Application	5.1 Introduction to Internet and its advantages 5.2 Requirements for Internet connection 5.3 Application of Internet 5.3.1 WWW (World Wide Web), 5.3.2 E-mail (Electronic mail), 5.3.3 Newsgroup, 5.3.4 Telnet, 5.3.5 IRC (Internet Relay Chat), 5.3.6 E-commerce, 5.3.7 Search engine and 5.3.8 E-Governance 5.3.9 Remote Control	10
6	Multimedia	6.1 Introduction to Multimedia 6.2 Components of Multimedia 6.2.1 Text 6.2.2 Audio 6.2.3 Video 6.2.4 Image 6.2.5 Animation 6.3 Application of Multimedia	8
7	Emerging Technology	7.1 Introduction to Emerging Technology 7.2 Concept of AI	8

		7.3 Concept of Cloud Computing and distributed computing 7.4 Concept of IOT 7.5 Concept of Big data 7.6 Concept of Data mining 7.7 Cryptography (Encryption and Decryption) 7.8 Concept of VR(Virtual Reality) and 7.9 Concept of AR(Augmented Reality)	
		Total	64

5. Suggested Practical and Project Works

The practical work that students do during their course is aimed at providing them learning opportunities to accomplish competency of the curriculum as well as reinforcing their learning of the theoretical subject content. Similarly, involving in a project work fostersthe self-learning of students in the both theoretical and practical contents. As this subject emphasizes to develop both theoretical and practical knowledge and skills, some of the practical and project works are suggested for the students. However, the tasks presented here are the samples only. A teacher can assign the extra practical and project works as per the students' need or specific context.

Unit	**Grade 9**		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to computer	1. Draw on chart paper “Computer and its parts” and demonstrate. 2. Make a presentation on the following topics: a. Features of computer b. Modern application area of computer 3. Conduct a speech competition on the topic 'Role of computer in education. 4. Draw on chart paper “Types of computer on the basis of working principle” and paste in your class room.	10

		5. Prepare a presentation about use and purpose of hybrid and super computer in different sector and demonstrate 6. Conduct a presentation the following topics: a. Type of computer on the basis of purpose. b. Type of computer on the basis of size and data handling. **c.** Type of computer on the basis of mode and brand.	
2	Computer Component	1. Describe computer system and its main unit by using power point presentation and demonstrate. 2. Prepare a presentation about "CPU is also known as brain of computer system" and demonstrate. 3. Prepare a presentation about different hardware found in computer lab and demonstrate. 4. Draw a chart paper about different types of computer hardware with name and paste in your class room. 5. Visit IT solution office such as computer maintenance center and sales, and collect the latest available devices.	10
3	Computer software	1. Collect names of software used in hospital, hotel, educational sector and other different sector surrounding you and group discussion about main objectives of these software. 2. Make a presentation of system, application and utility software used in your computer lab. 3. Prepare a presentation and demonstrate about open source software that you are familiar with and list its features. 4. Take a short interview with your teachers, friends,	8

		parents and relatives and prepare a field report about what types of computers, laptops or other devices they are using, what types of Operating System the device install. Also make a list of apps that they have used in their smart phones.	
4	Memory/Storage Unit	Describe computer memory and its main types by using power point presentation and demonstrate. 2. Prepare a presentation about "HDD and SSD" and demonstrate. 3. Prepare a presentation about different storage hardware found in computer lab and demonstrate. 4. Draw a chart paper about different types of computer memory with name and paste in your class room. 5. Visit IT solution office such as computer maintenance center and sales, and collect the latest available memory devices.	6
5	Internet and its Application	1. Collect name of ISP provider in your locality. 2. Make a presentation on "Internet Applications". 3. Prepare a Power Point Presentation file on a topic **"Current trends of Internet and its use in Nepal"**	12
6	Multimedia	1. Make a presentation on "Multimedia Applications". 2. Make a presentation on "Elements of multimedia". 3. Prepare a multimedia presentation on any contemporary topic.	8
7	Emerging Technology	1. Make a presentation on "Emerging Technology". 2. Consult to your computer teacher to follow the steps 'how to store information in cloud storage' and demonstrate. 3. Prepare a presentation file on a topic "**Examples of Services over Cloud**" and demonstrate in your class.	10

		4. Prepare a presentation file on a topic "Sophia Robot in Nepal" and demonstrate. 5. Prepare a presentation file on a topic "**Internet of Things (IoT) with example**" and demonstrate. 6. Prepare a presentation file on a topic "E-Governance" and demonstrate.	
	Total		**64**

6. Learning Facilitation Process

This course aims to blend both theoretical and practical aspects of knowledge and skills required in the subject. So, its facilitation process differs from the traditional method of delivery. The practical aspect is much more focused. So, methods and strategies that enable the practical skills in the students are much used in course of content facilitation. A facilitator encourages and assists students to learn for themselves engaging in different activities with practical tasks. To achieve the entire objectives from this syllabus, the teacher must use different techniques and process while teaching. In particular, the teacher can make use of the following methods and strategies for the learning facilitation:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction
- Question answer
- Demonstrations
- Online based instructions
- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 9 Subjects : Fundamentals of Computer and Application Time : 2 hrs.

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Introduction to computer	8	3	2	1	3	1	1	3	2	0	9	5	2	16	9	25	16	6
2	Computer Components	10																	7
3	Computer software	10																	9
4	Memory/Storage Unit	10																	8
5	Internet and its Application	10																	8
6	Multimedia	8																	6
7	Emerging Technology	8																	6
	Total	64	3	2	1	3	1	1	3	2	0	9	5	2	16	9	25	16	50

Fundamentals of electro-system

Grade: 9 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

We are surrounded by technological variants as this is the era of technological advancement and achievement. Many countries are in the race of technological development with environment protection. In this scenario, electricity has to play the massive role for all kinds of development and achievement in this era. So Electricity has to be a common part of a learning mechanism as world is dependent on electricity. The day to day activities of human are possible due to the use of electricity. We have gone through various transition phases of electricity in Nepal from load shedding to load shedding free Nepal within span of few years. Therefore, electricity and its components has the most admirable role in present context and its knowledge is to be increased. The electric terms, laws, magnets, ac and dc all are the basic components that are needed for effective learning of this technical syllabus. So Government of Nepal has developed this curriculum according to the National Curriculum framework 2076. The study of this course will help students to know about the unknown facts about the backbone of this technology.

The curriculum aims to help students on computer engineering to know about the basic electrical components as well as the mechanisms of working units of a computer. The curriculum comprises of Introduction to electro statistics, electric fundamentals, eectric circuit, electrical power and theory, cell and capacitor, magnetism and electromagnetism and fundamentals of current and phase current. All the chapters are well managed in terms of content to provide quality learning of the electric system. It will be delivered using both the conceptual and theoretical inputs through presentation, discussion, reflective reading and group works as well as practical and real world experiences through different practical activities.

The curriculum has been offered as per the structure of National Curriculum Framework 2076. It provides a comprehensive outline of level-wise competencies, grade-wise leaning outcomes and scope and sequence of contents, suggested practical/project

activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematic.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the knowledge of Electricity, its history, types and components with related components
2. Develop the knowledge of basic electric terms, electricity sources, and classification of objects on basis of resistance
3. Clarify the types of electric circuit, ohms law, Kirchhoff's voltage and current law
4. Elaborate the electrical power, its uses m derivation and electrical energy
5. Demonstrate the cell and capacitor and clarify its types, characteristics, units
6. Develop the knowledge of Magnetism and electromagnetism with its types, terminologies and principles and laws
7. Describe the Fundamentals of current and phase current with AC and DC, and other phase line system with its applications

3. Grade wise Learning Outcomes

SN	Content Area	Learning outcomes
1	Introduction to Electrostatics	1.1 Introduce the term electricity and its history. 1.2 Clarify the types of electricity i.e., static and dynamic. 1.3 Elaborate the uses and application of electricity. 1.4 Introduce the atom and its components electron, proton, Neutron. 1.5 Describe the atomic number, atomic weight, free electrons and electric charge. 1.6 Introduce the coulombs law and its derivation. 1.7 Introduce the concept of electric field, potential, potential difference with its applications. 1.8 Introduce Electrical energy, voltage and its unit.
2	Electric Fundamentals	2.1 Introduce the basic electric terms voltage, current, resistance and its units.

		2.2 Demonstrate and derive the movement of electrons in a conductor. 2.3 Illustrate the formation of electricity from various sources such as hydro, nuclear fission/fusion, wind, Thermal and solar. 2.4 Explain the conventional direction of electric current and its uses. 2.5 Demonstrate the uses and applications of resistance in a circuit. 2.6 Classify the objects on bias of resistance and explain its properties. 2.6.1 Conductor 2.6.2 Semiconductor 2.6.3 Insulator 2.7 Explain and demonstrate factors affecting the resistance.
3	Electrical circuit	3.1 Introduce the electric circuit. 3.2 Describe the following electric circuit with practical. 3. 2.1 Open Circuit 3.2.2Close circuit 3.2.3Leakage Circuit 3.2.4Series circuit 3.2.5Parallel Circuit 3.3 Explain and demonstrate the connection of resistance in series and parallel circuit. 3.4 Describe the advantages and disadvantages of series and parallel circuit. 3.5 Explain and demonstrate ohms' law with its applications. 3.6 Derive Kirchhoff's Laurent and Kirchhoff's voltage law with its applications. 3.7 Solve various numerical examples related to Electric

		circuit.
4	Electrical Power and Theory	4.1 Electrical power, its unit and its derivation. 4.2 Illustrate the practical application of electrical power. 4.3 Introduce electrical energy, its unit and practical application. 4.4 Solve various numerical examples related to electrical power and energy.
5	Cell and capacitor	5.1 Introduce cell and battery with its types. 5.2 Series and parallel connection of a cell. 5.3 Describe capacitor, capacitance and its units. 5.4 Illustrate the factors affecting capacitance and characteristics of capacitance. 5.5 Demonstrate the series and parallel plate capacitor.
6	Magnetism and Electromagnetism	6.1 Introduce the magnet and magnetism with its types temporary and permanent magnet. 6.2 Introduce magnet and non-magnetic materials. 6.3 Introduce the magnetic terminologies Magnetic field, magnetic field density, lines of magnetic flux, flux density. 6.4 Illustrate the magnetic effect and its application. 6.5 Principle of electromagnetism. 6.6 Explain faradays law of electromagnetic induction and demonstrate its applications.
7	Fundamentals of Current and phase current	1.1 Introduce AC and DC. 1.2 Differentiate between AC and DC. 1.3 Introduce the terms frequency, amplitude, form factor, time Hrs. and power factor with its units. 1.4 Distinguish between single phase and three phase system. 1.5 Explain the uses and applications of three phase systems.

4. Scope and sequence

Unit	Scope	Content	Hrs.
1	Introduction to Electrostatics	1.1 Introduction to Electricity 1.2 History of Electricity 1.3 Types of Electricity 1.3.1 Dynamic 1.3.2 Static 1.4Application and Uses of electricity 1.5Introduction to Atom and its components(electron, Proton, Neutron) 1.6Introduction to atomic number, atomic weight, free electrons and electric charge 1.7 Introduction to coulombs law and its derivation 1.8Introduction to electric field, potential and potential difference 1.9 Electric Energy, voltage and its unit	9
2	Electric Fundamentals	2.1 Introduction to Basic electric terms 2.1Voltage 2.2Current 2.3Resistance 2.2 Concept of movement of electrons in a conductor 2.3 Sources of electricity 2.3.1Hydro 2.3.2Nuclear fission/Fusion 2.3.3Wind 2.3.4Thermal 2.3.5Solar 2.4 Conventional Direction of electric current and its uses 2.5 Electrical resistance and its unit 2.6 Use and application of resistance in a circuit 2.7 Classification of objects on basis of resistance 2.7.1Conductor 2.7.2Semiconductor	13

		2.7.3Insulator 2.8 Concept of factors affecting the resistance	
3	Electric circuit	3.1 Introduction to electric circuit 3.2 Types of Electric circuit 3.2.1 Open circuit 3.2.2 Close circuit 3.2.3 Leakage circuit 3.2.4 Series Circuit 3.2.5Parallel circuit 3.2.6 Mix circuit 3.3Resistance in series and parallel circuit 3.4 Ohms Law 3.5 Kirchhoff's Laurent law 3.6 Kirchhoff'svoltage law 3.7Numerical	13
4	Electrical Power and Theory	4.1 Introduction to electrical power 4.2 Unit of electrical power and its practical concept 4.3Define electrical energy, its unit and applications 4.4Numerical	6
5	Cell and capacitor	5.1 Introduction to cell and battery 5.2 Types of cell 5.2.1 Primary 5.2.2 Secondary 5.3 Series and Parallel connection of a cell 5.4 Capacitor, capacitance and its units 5.5 Factors affecting capacitance 5.6 Characteristics of capacitance 5.7 Series and parallel plate capacitor	10
6	Magnetism and Electromagnetism	6.1 Introduction to magnet and magnetism 6.2 Types of Magnet 6.2.1 Temporary magnet 6.2.2 Permanent Magnet 6.3 Magnetic and non-magnetic materials 6.4 Introduction to Magnetic terminologies	8

		6.4.1 Magnetic field 6.4.2 Magnetic field density 6.4.3 Lines of magnetic flux 6.4.4 Flux density 6.5 Magnetic effect of current and its application 6.6 Principle of electromagnetism 6.7 Faradays law of electromagnetic induction	
7	Fundamentals of Current and phase current	1.1 Introduction to AC and DC 1.2 Differences between AC and DC 1.3 Define the following terms 1.3.1 Frequency 1.3.2 Amplitude 1.3.3 Time Hrs. 1.4 Difference between single phase and three phase system 7.5 Uses and applications of three phase systems	5
	Total		**64**

5. Suggested Practical and Project Works

The practical and project works are integral parts of reinforcing the students' learning. So the new curriculum provisions the practical and projects works as a part of curriculum. Some of the sample practical and project works are suggested herewith. However, a teacher can adapt them or use similar other project works as per their students need and specific context.

Unit	**Grade 9**		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to Electrostatics	1.Demonstrate the phenomenon of electrification by friction (static electricity)with help of glass bar and silk	6
2	Electric Fundamentals	1. Measure the resistance and specific resistance of a resistor using voltmeter, ammeter and ohm meter.	6

3	Electric circuit	1. Develop the basic circuit using wire voltage source resistance and a load. 2. Connect the resistance in series and parallel and calculate the equivalent resistance using voltmeter, ammeters and ohm meter.	12
4	Electrical Power and Theory	1. Connect the circuit with a voltmeter, ammeter and a resistor and determine the power and energy consumed by the resistor in 5 minutes.	8
5	Cell and capacitor	1. Connect a circuit with 4 batteries in series and parallel and hence find the equivalent e.m.f 2. Construct a simple parallel plate capacitor and verify the factors upon which the capacitance of the capacitor depends.	12
6	Magnetism and Electromagnetism	1. Perform the experiments with permanent magnet and identify magnetic field, its density and characteristics and observe the interaction of magnets.	8
7	Fundamentals of Current and phase current	1. Use oscilloscope and be familiar with its operation to measure ac/dc quantities. 2. To be familiar with 3-phase supply and 3-phase load.	12
	Total		**64**

6. Learning Facilitation Method and Process

Learning facilitation process is the crux of the teaching and learning activity. One topic can be facilitated through two or more than two methods or processes. The degree of usage will be based on the nature of the content to be facilitated. However, a teacher should focus on methods and techniques that are more students centered and appropriate to facilitate the content. The followingfacilitation methods, techniquesand strategieswillbeapplied while conductingthe teaching learningprocess:

- Group Discussion
- Field Visit and report presentation
- Demonstration
- Case study
- Questionnaire
- Practical Works
- Audio/Visual Class
- Web surfing
- Project Works
- Problem Solving.

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork,	5

		project work, practical works etc.	
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 9

Subjects : Fundamentals of electro-system

Time : 2 hrs.

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Introduction to Electrostatics	9	4	2	0	3	0	1	2	3	1	9	5	2	16	9	25	16	6
2	Electric Fundamentals	13																	10
3	Electric circuit	13																	10
4	Electrical Power and Theory	6																	6
5	Cell and capacitor	10																	7
6	Magnetism and Electromagnetism	8																	6
7	Fundamentals of Current and phase current	5																	5
	Total	64	4	2	0	3	0	1	2	3	1	9	5	2	16	9	25	16	50

Website Design

Grade: 9 **Credit hrs: 4** **Working hrs: 28**

1. Introduction

Internet has become one of the basic needs of life in many developed,and developing countries. Due to the pandemic like COVID-19 in 2020, internet has become most important factor in educational facilitation center. So, our day-to-day activities are now depending upon more and more on technology. Website is the base of the internet which provides information, data and everything we desire. So, website design is one of the potential markets in present. So, the comprehensive knowledge of website design will help students to know the ground reality of the internet and improve their knowledge who are willing to join this market. Learning of internet and web is the most prevalent field of ICT whose demand and usage is increasing day by day. So, government of Nepal has developed the curriculum in accordance to the national curriculum framework 2076. The study of this course will help students to maximize the use of technology and succeed them in professional life.

The curriculum aims to help student in web designing concepts. The curriculum comprises of a basics of website design, website design principles, HTML basic, HTML elements, HTML 5 basic, cascading style sheet and java script fundamentals. HTML leads to the design of static web pages and CSS provides better designing and java script with some dynamic tools of website. This course provides basic concept for overall web design and will help students to develop a sample page. There should be balance between theory and practical while delivering the course. The same applies in student evaluation procedure too.

The curriculum is structured in accordance with National Curriculum Framework, 2076. It focuses on both theoretical and practical aspects having equal teaching and practical. It incorporates the level-wise competencies, grade-wise leaning outcomes, scope and

sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematically

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the basic concept of website and internet.
2. State various principles and importance of websites.
3. Define, describe and demonstrate HTML.
4. Explainthe elements of HTML.
5. Elaborate the concepts of HTML 5.
6. Describe, illustrate and experiment Cascading Style Sheet (CSS) basics and Java-Script basics.
7. Design website using new web technologies.

3. Grade Wise Learning Outcomes

SN	Content Area	Learning outcomes
1	Basics in Website Design	1.1 Describe the brief history of internet. 1.2 Describe the world wide Web (WWW). 1.3 Illustrate WWW applications. 1.4 Describe web standards. 1.5 Demonstrate web protocols and application of web protocols. 1.6 Illustrate web browser and usage of web browser. 1.7 Demonstrate search engine and applications of search engine. 1.8 Discuss web domain and web hosting.
2	Website Design Principles	2.1 Describe the basic principles of Website development. 2.2 Illustrate the various phases of Website development. 2.3 Explain the importance of websites in contemporary world.
3	HTML Basics	3.1 Describe HTML and its documents. 3.2 Explain basic structure of HTML document.

		3.3 Demonstrate the creation of HTML document. 3.4 List and apply HTML tags in HTML document. 3.5 Explain HTML attributes. 3.6 Describe HTML comments.
4	HTML Elements	4.1 Define HTML elements 4.2 Explain and applyHeadings, Paragraphs, Line Breaking, Horizontal Line, Text Formatting, Lists, Tables, Frames, Hyperlinks, Multimedia (Image, Audio, Video), and Forms in HTML document.
5	HTML5 Basics	5.1 Discuss HTML 5. 5.2 Demonstrate new features in HTML 5 (Semantic elements, Audio and video, Canvas, SVG, Drag and drop and forms).
6	Cascading Style Sheets (CSS)	6.1 Discuss the concept of CSS. 6.2 Demonstrate creating style sheets. 6.3 Describe the types of CSS. 6.4 Explain CSS selectors. 6.5 Demonstrate the following CSS basic properties: *CSS Font, CSS colors and Backgrounds, CSS borders, CSS margins and Paddings, CSS text, CSS Height/Width, CSS position and float, CSS overflow, CSS Box model, CSS Navigation Bar* *6.6* Demonstrate the following CSS Advance properties: *CSS Rounded Corners, CSS border Images, CSS text Effects, CSS Gradient, CSS shadows* 6.7 Demonstrate CSS website layout.
7	JavaScript Fundamentals	7.1 Define JavaScript with its advantages. 7.2 Demonstrate the creation of JavaScript. 7.3 Demonstrate enabling of JavaScript in different browser. 7.4 Demonstrate the placement of JavaScript in HTML documents.

		7.5 Explain Java Script variables and data types. 7.6 Demonstrate JavaScript HTML DOM (DOM Introduction, DOM Methods, DOM Document, DOM Elements, DOM Node lists) 7.7 Explain JavaScript control flow statements. 7.8 Demonstrate conditional statement in JavaScript. 7.9 Demonstrate loop statement in JavaScript. 7.10 Demonstrate JavaScript functions. 7.11 Demonstrate JavaScript interaction using Prompt, Confirm, Alert 7.12 Discuss JavaScript objects.

8 Scope and Sequence

Unit	Scope	Content	Hrs.
1	Basics in Website Design	1.1 Brief History of Internet 1.2 World Wide Web (WWW) 1.3 Web Standards 1.4 Web Protocols 1.5 Web Browser 1.6 Search Engine 1.7 Web Domain 1.8 Web Hosting	6
2	Website Design Principles	2.1 Basic principles of website development 2.2 Phases of website development 2.3 Importance of websites in contemporary world.	4
3	HTML Basics	3.1 Introduction 3.2 HTML Documents 3.3 Basic Structure of HTML document. 3.4 HTML Tags 3.4.1 Paired and Singular Tags 3.4.2 Lists of HTML Tags 3.5 HTML Attributes 3.6 HTML Comments	6

4	HTML Elements	4.1 Introduction 4.2 Headings 4.3 Paragraphs 4.4 Line Breaking 4.5 Horizontal Line 4.6 Text Formatting 4.7 Lists 4.8 Tables and Frames 4.9 Hyperlinks 4.10 Multimedia (Image, Audio, Video) 4.11 Forms	15
5	HTML5 Basics	5.1 Introduction 5.2 New Features in HTML5 5.2.1 HTML5 Semantic Elements 5.2.2 HTML5 Audio and Video 5.2.3 HTML5 Canvas 5.2.4 HTML5 SVG 5.2.5 HTML5 Drag and Drop 5.2.6 HTML5 Forms (new attributes for <input> tag)	5
6	Cascading Style Sheets (CSS)	6.1 Introduction 6.2 Types of CSS 6.3 CSS Selectors 6.4 CSS Basic Properties 6.4.1 CSS Font 6.4.2 CSS Colors and Background 6.4.3 CSS Borders 6.4.4 CSS Margins and Paddings 6.4.5 CSS Text 6.4.6 CSS Height/Width 6.4.7 CSS Position and Float 6.4.8 CSS Overflow 6.4.9 CSS Box Model 6.4.10 CSS Navigation Bar	18

		6.5 CSS Advance Properties 6.5.1 CSS Rounded Corners 6.5.2 CSS Border Images 6.5.3 CSS Text Effects 6.5.4 CSS Gradients 6.5.5 CSS Shadows 6.6 CSS Measurement Units 6.7 CSS Website Layout	
7	JavaScript Fundamentals	7.1 Introduction 7.2 JavaScript in Different Browser 7.3 JavaScript in Html Documents 7.4 Variables and Data types 7.5 HTML DOM 7.5.1 DOM Introduction 7.5.2 DOM Methods 7.5.3 DOM Document 7.5.4 DOM Elements 7.5.5 DOM Node Lists 7.6 Control Flow Statement 7.6.1 Conditional Statement (if, if else, switch) 7.6.2 Loop Statement (for, while, do while) 7.7 Functions 7.8 Prompt, Confirm, Alert 7.9 Objects	10
		Total	64

5. Suggested Practical and Project Works

Practical and project work is an integral part of technical and vocational subjects. They are carried out to consolidate the practical learning experiences. Some of the suggested practical and project work activities are mentioned below. As these are the basic and fundamental practical and project works, the teacher can adapt or introduce more relevant to their context and students' needs.

Unit	Grade 9		
	Scope	**Practical Activities**	**Hrs.**
1	Basics in Website Design	**1.** Demonstrate different web browser. **2.** Demonstrate different search engine **3.** Demonstrate web domain and web hosting.	2
2	Website Design Principles	1. Review on some famous websites.	2
3	HTML Basics	1. Create and save HTML documents. 2. Construct html tags with attributes. **3.** Create html comments.	2
4	HTML Elements	Write HTML code for following: 1. Headings 2. Paragraphs 3. Line Breaking 4. Horizontal Line 5. Text Formatting 6. Lists 7. Tables and Frames 8. Hyperlinks 9. Multimedia (Image, Audio, Video) 10. Forms	14
5	HTML5 Basics	Write HTML5 code for following: 1. HTML5 Semantic Elements 2. HTML5 Audio and Video 3. HTML5 Canvas 4. HTML5 SVG 5. HTML5 Drag and Drop **6.** HTML5 Forms (new attributes for <input> tag)	4
6	Cascading Style Sheets (CSS)	Write Code for CSS Basic Properties: 1. CSS Font	20

		2. CSS Colors and Background 3. CSS Borders 4. CSS Margins and Paddings 5. CSS Text 6. CSS Height/Width 7. CSS Position and Float • CSS Overflow • CSS Box Model • CSS Navigation Bar 8. Write code for CSS Advance Properties: • CSS Rounded Corners • CSS Border Images • CSS Text Effects • CSS Gradients • CSS Shadows 9. Create html layout using CSS. 10. Demonstrate html measurement units.	
7	JavaScript Fundamentals	1. Enable/Disable JavaScript in browser. 2. Create and embed JavaScript in HTML. 3. Create variables in JavaScript. 4. JavaScript code to demonstrate HTML DOM 5. Write JavaScript program to demonstrate if statement. 6. Write JavaScript program to demonstrate if...else statement. 7. Write JavaScript program to demonstrate switch statement. 8. Write JavaScript program to demonstrate for statement. 9. Write JavaScript program to demonstrate while statement. 10. Write JavaScript program to demonstrate do...while statement.	20

		11. Write JavaScript program to demonstrate prompt, confirm and alert statement. 12. Write JavaScript programs to create functions. 13. Write JavaScript programs to demonstrate objects.	
		Total	64

6. Learning Facilitation Process

Learning facilitation process is determined according to the content to be dealt in the subject. It's also an art of teacher. The teacher should utilize such teaching methods and techniques that are appropriate to the contents and needs of the students. In facilitating the course, various approaches, methods and techniques are used. To be particular, the following major methods and strategies are used in this subject:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction
- Question answer
- Demonstrations
- Online based instructions
- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 9 Subjects : Website Design Time : 2 hrs.

Unit	Content	Credit hrs	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Basics in Website Design	6																	6
2	Website Design Principles	4																	3
3	HTML Basics	6																	6
4	HTML Elements	15	3	2	1	3	1	0	3	2	1	9	5	2	16	9	25	16	9
5	HTML5 Basics	5																	5
6	Cascading Style Sheets (CSS)	18																	15
7	JavaScript Fundamentals	10																	6
	Total	64	3	2	1	3	1	0	3	2	1	9	5	2	16	9	25	16	50

Grade Ten
Data structure & OOP concept using C++

Grade: 10 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

In computer engineering, a data structure is a data organization, management and storage format that enable efficient access and modification. Object oriented programming is a solving complex program by breaking them into smaller program using objects. The main plan of OOP is to bind together the data and the functions that operate on them so that no other part of the code can access this data except that function.This curriculum presumes that the students joining grade 10 Computer Engineering stream come with diverse aspirations, some may continue to higher level studies in specific areas of OOP concept using C++. The curriculum is designed to provide students with general understanding of the Object-Oriented Programming.

This curriculum comprises of fundamental conceptual principles and practices, basic introduction to data structure, concept of object oriented programming (OOP) using C++, class and object, abstraction and Encapsulation, Inheritance, Polymorphism. It will be delivered using both the conceptual and theoretical inputs through presentation, discussion, reflective reading and group works as well as practical and real world experiences through different practical activities.

The curriculum has been offered as per the structure of National Curriculum Framework 2076. It provides a comprehensive outline of level-wise competencies, grade-wise leaning outcomes and scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematic.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop object-oriented programming with its feature and applications.
2. Describe fundamentals of C++

3. Define concepts of class and objects.
4. Elaborate concepts of abstraction and encapsulation.
5. Use inheritance in OOP.
6. Illustrate concepts of polymorphism.

3. Grade wise learning Outcomes

S.N.	Content Area	Learning outcomes
1	Basic Introduction to Data Structure	1.1 Illustrate Data Structures and itsAdvantages. 1.2 Describe terms Used in Data Structures (Data, Group Item, Record, Entity, Attribute or Field, File) 1.3 Demonstrate need of Data Structures 1.4 Explain the classification of Data Structures. 1.5 Linear Data Structure (Array, Linked List, Stack, Queue) and Non-Linear Data Structure (Trees, Graphs) 1.6 Illustrate Operation on Data Structures (Searching, Sorting, Insertion, Deletion, Traversing).
2	Concept Of Object Oriented Programming (OOP) using C++	2.1 Illustrate Object Oriented Programming,features of OOP and itsapplications. 2.2 Illustrate Structured Vs Object-Oriented Programming. 2.3 Discuss C++. 2.4 Interpret tokens and character sets. 2.5 Describe data type and format specific. 2.6 Explain basic input/ output. 2.7 Experiment basic program structure. 2.8 Construct various control statements.
3	Class and Object	1. Illustrateclass and object. 2. Demonstrate Access Specific. 3. Experiment the declaration of class and object. 4. Construct class methods and data members.

		5. Explain the concept of constructor and destructor.
4	Abstraction and Encapsulation	1. Define abstraction. 2. Discuss advantages of abstraction. 3. Experiment to achieve abstraction using C++ Program 4. Define abstraction. 5. Discuss advantages of abstraction. 6. Experiment to achieve abstraction using C++ Program.
5	Inheritance	1. Illustrate inheritance. 2. Illustrate advantages of inheritance. 3. Explain base class and derived class. 4. State and experiment syntax of inheritance. 5. Elaborate and experiment types of Inheritance.
6	Polymorphism	1. Illustrate polymorphism. 2. Illustrate advantages of polymorphism. 3. State and experiment syntax of polymorphism. 4. state types of polymorphism. 5. State and describefunction overriding.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Basic Introduction to Data Structure	1.1 Introduction to Data Structures. 1.2 Advantages of Data Structures. 1.3 Terms Used in Data Structures (Data, Group Item, Record, Entity, Attribute or Field, File). 1.4 Need of Data Structures. 1.5 Classification of Data Structures. 1.5.1Concept of Linear Data Structure (Array, Linked List, Stack, Queue). 1.5.2 Concept of Non-Linear Data Structure(Trees, Graphs). 1.6 Operation on Data Structures (Searching,	20

		Sorting, Insertion, Deletion, Traversing).	
2	Concept Of Object Oriented Programming (OOP) using C++	2.1 Introduction to Object Oriented Programming. 2.2 Features. 2.3 Application. 2.4 Structured Vs Object Oriented Programming. 2.5 Tokens and Character Sets. 2.6 Data Type and Format Specific. 2.7 Basic Input/ Output. 2.8 Basic Program Structure. 2.9 Control Statements .	10
3	Class and Object	3.1 Introduction to class and object. 3.2 Access Specific 3.3 Declaration of class and object. 3.4 Class Methods and Data Members. 3.5 Concept of Constructor and Destructor.	7
4	Abstraction and Encapsulation	4.1 Introduction to Abstraction. 4.2 Advantages of Abstraction. 4.3 Achieve Abstraction using C++ Program. 4.4 Introduction to Encapsulation. 4.5 Advantages of Encapsulation. 4.6 Achieve Encapsulation using C++ Program.	7
5	Inheritance	5.1 Introduction to Inheritance. 5.2 Advantages of Inheritance. 5.3Base Class and Derived Class. 5.4Syntax of Inheritance. 5.5Types of Inheritance. 5.5.1Single Inheritance. 5.5.2Multilevel Inheritance. 5.5.3Multiple Inheritance. 5.5.4Hierarchical Inheritance. 5.5.5Hybrid Inheritance.	10
6	Polymorphism	6.1 Introduction to Polymorphism. 6.2 Advantages of Polymorphism. 6.3 Syntax of Polymorphism.	10

		6.4 Types of Polymorphism. 6.5 Function overriding.	
		Total	64

5. Suggested Practical and Project Works

The practical work that students do during their course is aimed at providing them learning opportunities to accomplish competency of the curriculum as well as reinforcing their learning of the theoretical subject content. Similarly, involving in a project work fostersthe self-learning of students in the both theoretical and practical contents. As this subject emphasizes to develop both theoretical and practical knowledge and skills, some of the practical and project works are suggested for the students. However, the tasks presented here are the samples only. A teacher can assign the extra practical and project works as per the students' need or specific context.

Unit	**Grade 10**		
	Scope	**Practical Activities**	**Hrs.**
2	Concept of Object Oriented Programming (OOP) using C++	1. Write a C++ program to demonstrate basic program structure. 2. Write programs to experiment if statement. 3. Write programs to experiment if...else statement. 4. Write programs to experiment if... else ladder statement. 5. Write programs to experiment nested if statement. 6. Write programs to experiment switch statement. 7. Write programs to experiment for loop statement. 8. Write programs to experiment while loop statement. 9. Write programs to experiment do...while statement. 10. Write programs to experiment if statement.	20

		11. Write programs to experiment nested statement.	
3	Class and Object	1. Write program to declare class and object. 2. Write program to demonstrate access specific in class. 3. Write program to declare methods and data members in class. 4. Write program to demonstrate accessing data members and member function of class. 5. Write program to create constructor and destructor.	20
4	Abstraction and Encapsulation	1. Write program to demonstrate abstraction. 2. Write program to demonstrate encapsulation	4
5	Inheritance	1. Write a program to show inheritance. 2. Write programs to demonstrate single inheritance. 3. Write programs to demonstrate multilevel inheritance. 4. Write programs to demonstrate multiple inheritance. 5. Write programs to demonstrate hierarchical inheritance. 6. Write programs to demonstrate hybrid inheritance.	20
	Total		**64**

6. Learning Facilitation Process

This course intends to provide both theoretical as well as practical knowledge and skills on the subject, thereby, blends with both theoretical and practical facilitation strategies to ensure better learning. In fulfilling the learning outcomes stated in the curriculum, the teacher should use a variety of methods and techniques that fit to the contents. In

particular, the following methods, techniques and strategies are used for learning facilitation:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction
- Question answer
- Demonstrations
- Online based instructions
- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 10 Subjects : Data structure & OOP concept using C++ Time : 2 hrs.

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Basic Introduction to Data Structure	20	4	3	0	4	2	1	1	0	1	9	5	2	16	9	25	16	15
2	Concept Of Object Oriented Programming (OOP) using C++	10																	14
3	Class and Object	7																	2
4	Abstraction and Encapsulation	7																	5
5	Inheritance	10																	7
6	Polymorphism	10																	7
	Total	64	4	3	0	4	2	1	1	0	1	9	5	2	16	9	25	16	50

Computer Hardware, Electronics Repair and Maintenance

Grade: 10 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Computer repair is PC repairs that process of identifying, troubleshooting and resolving problems and issues in a faulty computer. Computer repair is a broad field encompassing many tools, techniques and procedures used to repair computer hardware, software or network/Internet problems. It is the practice of keeping computers in a good state of repair. This curriculum presumes that the students joining grade 10Computer Engineering stream come with diverse aspirations, some may continue to higher level studies in specific areas of Computer Hardware, Electronics Repair and Maintenance subject. The curriculum is designed to provide students with general understanding of the fundamental Computer laws and principles that govern the Computer phenomena in the world.

This curriculum comprises of fundamental conceptual principles and practices, an introduction to electronic devices, introduction to computer system, overview on system's core, troubleshooting techniques, repair and maintenance, backup and recovery. It will be delivered using both the conceptual and theoretical inputs through presentation, discussion, reflective reading and group works as well as practical and real world experiences through different practical activities.

The curriculum is structured in accordance with National Curriculum Framework, 2076. It focuses on both theoretical and practical aspects having equal teaching and practical. It incorporates the level-wise competencies, grade-wise leaning outcomes, scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematically.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the basic concept of Semiconductor material, Circuit theory and their properties

2. Elaborate basic concepts of Computer System and its components
3. Demonstrate necessity of System's Core
4. Illustrate the Troubleshooting and its techniques
5. Describe the importance of Repair and Maintenance
6. Use backup and recovery in computer system

3. Grade wise learning Outcomes

S.N.	Content Area	Learning outcomes
1	Introduction to Electronic Devices	1.1 Describe matter, molecule and atom. 1.2 Introduction to KCL, KVL 1.3 Introduction to Semiconductor Material. (Doping, P-type, N-type, Majority and Minority charge carrier) 1.4 Demonstrate PN junction Formation,Forward biased & Reverse biased.
2	Introduction to Computer System	1. Introduce to components of Computer System. 2. Demonstrate input unit: Keyboard, Mouse, Scanner, Digital Camera. 3. Demonstrate processing unit: ALU & Control Unit. 4. Demonstrate to display unit: Monitor Resolution, color and refresh rate, CRT, LCD and LED.
3	Overview on System's Core	1. Introduce system BIOS and its functions and operations. 2. Introduce Motherboard and describe its form factors. 3. Demonstrate Peripheral component interconnect (PCI) local bus. 4. Introduce Power: The internal power supply, parts of power supply. 5. Introduce Hard drives and its construction and operation. 6. Demonstrate Partitioning, partition size and drive

		lettering. 7. Describe Formatting and types.
4	Troubleshooting Techniques	1. Introduce general troubleshooting techniques. 2. Describe the Steps of troubleshooting. 3. Demonstrate the troubleshooting boot problems. 4. Demonstrate troubleshooting boot time error messages. 5. Demonstrate troubleshooting system slowdowns. 6. Describe troubleshooting specific components.
5	Repair and Maintenance	1. Introduction to preventive Maintenance of the system. 2. Demonstrate Fixing wireless network connection issues. 3. Describe Power source and power protection. 4. Demonstrate Failure or improper operation of video cards. 5. Describe Image quality problems in Monitors (Resolution, Layout). 6. Introduce Input & Output device connection issues. 7. Describe Processor power and voltage level. 8. Introduction to Processor cooling. 9. Describe Cooling and ventilation. 10. Describe Virus Background. 11. Demonstrate Virus detection, protection and prevention techniques.
6	Backup and Recovery	1.Introduce to Backup and Recovery. 2. Describe Backup methods, devices and media. 3. Demonstrate Backup scheduling and media rotation systems. 4. Introduction to RAID. 5. Describe Recovery Techniques.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to Electronic Devices	1.1 Define matter, molecule and atom 1.2 Introduction to KCL, KVL 1.3 Introduction to Semiconductor Material (Doping, P-type, N- type, Majority and Minority charge carrier) 1.4 PN junction Formation,Forward biased & Reverse biased	10
2	Introduction to Computer System	2.1 Introduction to Basic Components of Computer System 2.2 Input Unit: Keyboard, Mouse, Scanner and Digital Camera 2.3Introduction to processing unit: ALU & Control Unit 2.4Introduction to Display unit: Monitor Resolution, color and refresh rate, CRT, LCD and LED	10
3	Overview on System's Core	3.1 Introduction to system BIOS 3.1.1 System BIOS functions and operations 3.2Introduction to Motherboard 3.2.1 Motherboard form factors 3.3 Peripheral component interconnect (PCI) local bus 3.4Power: The internal power supply, parts of power supply 3.5 Introduction to Hard drives 3.5.1 Construction and operation of Hard disk drive 3.6Partitioning, partition size and drive	12

		lettering 3.7Formatting and types	
4	Troubleshooting Techniques	4.1 General troubleshooting techniques 4.2 Steps of troubleshooting 4.3 Troubleshooting boot problems 4.4 Troubleshooting boot time error messages 4.5 Troubleshooting system slowdowns 4.6 Troubleshooting specific components	12
5	Repair and Maintenance	5.1 Preventive Maintenance of the system 5.2 Fixing wireless network connection issues 5.3 Power source and power protection 5.4 Failure or improper operation of video cards 5.5Image quality problems in Monitors (Resolution, Layout) 5.6 Input & Output device connection issues 5.7 Processor power and voltage level 5.8 Introduction to Processor cooling 5.9 Cooling and ventilation 5.10 Virus Background 5.11 Virus detection, protection and prevention techniques	12
6	Backup and Recovery	6.1 Introduction to Backup and Recovery 6.2 Backup methods, devices and media 6.3 Backup scheduling and media rotation systems 6.4 Introduction to RAID 6.5 Recovery Techniques	8
			Total: 64

5. Suggested Practical and Project Works

The practical and project works are integral parts of reinforcing the students' learning. So the new curriculum provisions the practical and projects works as a part of curriculum. Some of the sample practical and project works are suggested herewith. However, a teacher can adapt them or use similar other project works as per their students need and specific context.

Unit	**Grade 10**		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to Electronic Devices	1. Verification of Kirchhoff's current and voltage laws 2. Demonstrate the characteristics of PN junction diode	4
2	Introduction to Computer System	1. Demonstrate the basic components of computer system and their connectivity (Input, Output, Processor and memory system)	6
3	Overview on System's Core	1. Insertion of peripheral card like audio, NIC, Modem,Video cards, Power Connection, Processor and heat sink fitting 2. Management of Hard disk(Partition and formatting),BIOS setup and installation of Operating System(Windows, Linux),Installation of Device Drivers, Installation of Application Programs and antivirus	14
4	Troubleshooting Techniques	1. Demonstrate general troubleshooting techniques 2. Illustrate the steps of troubleshooting 3. Familiarize troubleshooting boot problems 4. Demonstrate troubleshooting of system slowdowns 5. Illustrate the troubleshooting of specific components	14

5	Repair and Maintenance	1. Demonstrate wireless network connection issue along with repair and maintenance techniques 2. Illustrate the required steps for repair and maintenance of Memory Not Recognized issue, Out of Memory problem, Performance issue,Video card failure or improper operations, Image quality problem, Booting or operation problem 3. Familiarization to Disk compression issue, Configuration problem,Audio issue, Peripheral I/o ports, keyboards, mice, modem, network card, operation and connection problem, speed issue,Application program failure along with effective repair and maintenance techniques	16
6	Backup and Recovery	1. Configure Data Backup and Recovery in available Windows Operating System 2. Demonstration of RAID(Redundant array of independent disks) configuration and its necessity for efficient storage and recovery	10
	Total		**64**

6. Learning Facilitation Process

This course aims to blend both theoretical and practical aspects of knowledge and skills required in the subject. So, its facilitation process differs from the traditional method of delivery. The practical aspect is much more focused. So, methods and strategies that enable the practical skills in the students are much used in course of content facilitation. A facilitator encourages and assists students to learn for themselves engaging in different activities with practical tasks. To achieve the entire objectives from this syllabus, the teacher must use different techniques and process while teaching. In

particular, the teacher can make use of the following methods and strategies for the learning facilitation:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction
- Question answer
- Demonstrations
- Online based instructions
- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 10 Subjects : Computer Hardware, Electronics Repair and Maintenance Time : 2 hrs.

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Introduction to Electronic Devices	10	7	4	0	2	1	1	0	0	1	9	5	2	16	9	25	16	7
2	Introduction to Computer System	10																	7
3	Overview on System's Core	12																	9
4	Troubleshooting Techniques	12																	10
5	Repair and Maintenance	12																	11
6	Backup and Recovery	8																	6
	Total	64	7	4	0	2	1	1	0	0	1	9	5	2	16	9	25	16	50

Database Management System

Grade: 10 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Data and information is the foundation of every business organization. If the data is relevant, accurate and organized properly it will help in the rapid growth of the organization. If data is not organized it will be useless and even harmful to the organization. Therefore, data management initiatives should be taken in order to increase the quality of the data and information.DBMS have become an integral part of every kind of work, whether in managing business-related data or managing our household accounts.

This curriculum comprises of fundamental conceptual principles and practices, an Introduction to database system, entity relationship model (ER- Model), relational model, SQL (Structured Query Language) overview, relational database design, database transaction, database backup recovery, security. It will be delivered using both the conceptual and theoretical inputs through presentation, discussion, reflective reading and group works as well as practical and real world experiences through different practical activities.

The curriculum has been offered as per the structure of National Curriculum Framework 2076. It provides a comprehensive outline of level-wise competencies, grade-wise leaning outcomes and scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematic.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the basic concept of database system.
2. Define and construct Entity Relationship Model (ER-model).
3. Use and experiment the Relational Model.
4. Construct Structure Query Language (SQL).

5. Use functional dependency and normalization in Relational Database design.
6. Describe and generalize database transaction.
7. Demonstrate the database backup, recovery and security.

3. Grade wise learning Outcomes

S.N.	Content Area	Learning outcomes
1	Introduction to Database System	1.1 Discuss concept of data, information, database, and database management system. 1.2 List the limitations of file system. 1.3 Illustrate advantages and disadvantages of database system. 1.4 Elaborate application of database system. 1.5 Explain types of database users. 1.6 Demonstrate DBMS architecture. 1.7 Interpret database Model. **1.8** Describe database schema.
2	Entity Relationship Model (ER- Model)	2.1 Illustrate ER-Model. 2.2 Discuss components of ER-model. 2.3 Illustrate and interpret entity, weak entity, entity Set. 2.4 Illustrate attributes, explain its type. 2.5 Illustrate relationship and discuss its type. 2.6 Explain mapping cardinalities. 2.7 Discuss and experiment keys in DBMS.
3	Relational Model	3.1 Discuss Relational Model. 3.2 Explain and analyze following key Concepts in Relational Model: *Tables, Tuple, Cardinality, and Column, Attribute, Degree and Domain, Relational Instance, Relational Schema, Relational Key* 3.3 Describe the properties of relations. **3.4** Experiment mapping ER-model to relation Model.

4	SQL (Structured Query Language) Overview	4.1 Illustrate SQL. 4.2 Discuss types of SQL. 4.3 Experiment with different commands of DDL, DCL, and DML. 4.4 Discuss and construct SQL Clause. 4.5 Illustrate, elaborate and experiment SQL Joins. 4.6 Discuss the concept of SQL views.
5	Relational Database Design	5.1 Illustrate functional dependency. 5.2 Discuss normalization. 5.3 Elaborate and experiment types of normalization.
6	Database Transaction	1.1 Illustrate transaction. 1.2 Explain concurrency in transaction. 1.3 Describe ACID properties. 1.4 Elaborate state of transaction.
7	Database Backup, Recovery, and Security.	1.1 Discuss backup. 1.2 Discuss type of backup. 1.3 Explain reasons for database failure. 1.4 Illustrate methods of database backup. 1.5 Discuss the concept of recovery, redo/undo. 1.6 Illustrate database security. 1.7 Discuss common threats in database.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to Database System	1.1 Concept of Data, Information, Database and Database Management System 1.2 Limitations of File System 1.3 Advantages and Disadvantages of Database System 1.4 Application of Database System 1.5 Types of Database Users	6

		1.6 DBMS Architecture 1.7 Database Model 1.8 Database Schema	
2	Entity Relationship Model (ER- Model)	1.3 Introduction to ER-Model 1.4 Components of ER-Model 1.4.1 Entity, Weak Entity, Entity Set 1.4.2 Attributes, Types of Attributes 1.4.3 Relationship, Types of Relationship 1.5 Mapping Cardinalities 1.6 Keys in DBMS	10
3	Relational Model	3.1Introduction to Relational Model 3.2 Key Concepts in Relational Model 3.2.1 Tables 3.2.2 Tuple, Cardinality, and Column 3.2.3 Attribute, Degree and Domain 3.2.4 Relational Instance 3.2.5 Relational Schema 3.2.6 Relational Key 3.3 Properties of Relations 3.4 Mapping ER-Model to Relation Model	10

4	SQL (Structured Query Language) Overview	4.1 Introduction 4.2 Types of SQL 1. Data Definition Language (DDL) (Commands: CREATE, ALTER, DROP, RENAME) 2. Data Manipulation Language (DML) (Commands: SELECT, INSERT, UPDATE, DELETE) 3. Data Control Language (DCL) (Commands: GRANT, REVOKE) 4.3 SQL Clause (WHERE, AND, OR, WITH, ORDER BY) 4.4 SQL Joins 4.4.1 Inner Join 4.4.2 Natural Join 4.4.3 Left Outer Join 4.4.4 Right Outer Join 4.4.5 Full Outer Join 4.5 SQL View	14
5	Relational Database Design	5.1 Functional Dependency and its Type 5.2 Normalization 5.2.1 Definition 5.2.2 Normal Forms (1NF, 2NF, 3NF)	8
6	Database Transaction	1.1 Introduction to Transaction 1.2 Concurrency in Transaction 1.3 ACID properties 1.4 State of Transaction	8
7	Database Backup Recovery, and Security	7.1 Introduction to Backup 7.2 Types of Backup 7.2.1 Physical Backup	8

		7.2.2 Logical Backup 7.3 Reasons for Database Failure 7.4 Methods of Database Backup 7.5 Concept of Recovery, Redo/Undo 7.6 Introduction to Database Security 7.7 Common Threats in Database	
		Total	64

5. Suggested Practical and Project Works

Practical and project work is an integral part of technical and vocational subjects. They are carried out to consolidate the practical learning experiences. Some of the suggested practical and project work activities are mentioned below. As these are the basic and fundamental practical and project works, the teacher can adapt or introduce more relevant to their context and students' needs.

Unit	**Grade 10**		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to Database System	**1.** Install and configure MSSQL server. **2.** Elaborate basic working of MSSQL server	4
2	Entity Relationship Model (ER- Model)	**1.** Design ER-diagram of some related systems.	10
3	Relational Model	**1.** Interpret the ER-diagram designed in unit 2 to relational model.	10
4	SQL (Structured Query Language) Overview	1. Create databases and tables using create command. 2. Modify database and table using alter command. 3. Delete databases and tables using drop command. 4. Create keys in tables.	25

		5. Insert data in table using insert commands. 6. Update data in table using update commands. 7. Retrieve data using select command. 8. Delete data using delete command. 9. Manipulate tables using SQL Clause: 10. (where, and, or, with, order by) 11. Retrieve data from multiple tables using SQL join command. 12. Create and retrieve data from SQL views.	
5	Relational Database Design	**1.** Demonstrate the anomalies while manipulating tables. **2.** Experiment the use of normalization to remove above anomalies.	10
7	Database Backup Recovery, and Security	1. Create backup of MSSQL database. 2. Recover the backup database.	5
	Total		64

6. Learning Facilitation Method and Process

Learning facilitation process is the crux of the teaching and learning activity. One topic can be facilitated through two or more than two methods or processes. The degree of usage will be based on the nature of the content to be facilitated. However, a teacher should focus on methods and techniques that are more students centered and appropriate to facilitate the content. The followingfacilitationmethods, techniques and strategies will beapplied while conductingthe teaching learningprocess:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction

- Question answer
- Demonstrations
- Online based instructions
- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2

4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 10 Subjects : Database Management System Time : 2 hrs.

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Introduction to Database System	6	7	2	1	2	2	1	0	1	0	9	5	2	16	9	25	16	2
2	Entity Relationship Model (ER- Model)	10																	10
3	Relational Model	10																	6
4	SQL (Structured Query Language) Overview	14																	14
5	Relational Database Design	8																	6
6	Database Transaction	8																	6
7	Database Backup Recovery, and Security	8																	6
	Total	64	7	2	1	2	2	1	0	1	0	9	5	2	16	9	25	16	50

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Digital Design and Microprocessor

Grades: 10 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Digital design is a type of visual communication that presents information or a product or service through a **digital** interface. A Microprocessor is an important part of computer architecture without which you will not be able to perform anything on your computer. This curriculum presumes that the students joining grade 10 Computer Engineering stream come with diverse aspirations, some may continue to higher level studies in specific areas of Digital Design and Microprocessor subject. The curriculum is designed to provide students with general understanding of the fundamental Computer laws and principles that govern the Computer phenomena in the world.

This curriculum comprises of fundamental conceptual principles and practices, number system and binary arithmetic operations, concept of logic gates, boolean algebra and karnaughmap, binary arithmetic and combinational logic, introduction to microprocessor and its components.

It will be delivered using both the conceptual and theoretical inputs through presentation, discussion, reflective reading and group works as well as practical and real world experiences through different practical activities.

The curriculum is structured in accordance with National Curriculum Framework, 2076. It focuses on both theoretical and practical aspects having equal teaching and practical. It incorporates the level-wise competencies, grade-wise leaning outcomes, scope and sequence of contents, suggested practical/project activities, learning facilitation process and assessment strategies so as to enhance the learning on the subject systematically.

2. Competencies

On completion of the course, the students will have the following competencies:

1. Develop the basic concept of Number system and arithmetic operations
2. Elaborate basic concepts of Logic gates
3. Demonstrate necessity of Boolean algebra and Karnaugh map in digital system

4. Illustrate the Binary arithmetic and combinational circuit's necessity
5. Use microprocessor system

3. Grade wise learning Outcomes

S.N.	Content Area	Learning outcomes
1	Number system and Binary arithmetic operations	1.Introduce Numbering concept. 2.Describe different types of numbering system. 2.1Decimal numbers. 2.2Binary numbers. 2.3Octal numbers. 2.4Hexadecimal numbers. 3. Demonstrate number conversion. 3.1 Decimal integer to binary and binary to decimal. 3.2Decimal fractions to binary conversion. 3.3Octal to decimal and decimal to octal conversion. 4. Introduce to 1's complement. 5. Introduce 2's complement. 6. Introduce Binary addition. 7. Introduce Binary subtraction. 8. Introduce Binary Multiplication.
2	Concept of logic gates	1.Illustrate Notations. 2. Demonstrate the Concept of gate and truth table. 2.1Inverter. 2.2OR gate. 2.3AND gate. 2.4NOR gate. 2.5NAND gate. 2.6Universal gates.

		3. Describe De-Morgan's theorem.
3	Boolean algebra and Karnaugh Map	1.Introduce Boolean relationships Simplifications. 2.Introduce Sum of products (SOP). 3. Introduce toProduct of sum (POS). 4.Introduce to Algebraic simplifications.
4	Binary arithmetic and Combinational Logic	1.Introduce to Half adder. 2.Introduce Binary adder. 3. Introduce toHalf subtractor. 4. Introduce Full adder. 5. Introduce Full subtractor. 6.Demonstrate Code converters. 7. Describe Encoder and Decoder. 9.Demonstrate Multiplexer and Demultiplexer.
5	Introduction to Microprocessor and its components	1. Introduction to Microprocessor and its applications. 2.Describe the types of Microprocessor. 3.Describe the Input/output. 4.Describe Memory. 5.Demonstrate Processing unit. 5.1Arithmetic and logical unit, control unit, Registers. 6. Describe the 8085 bus structure and internal architecture. 7.Introduce Pin configuration of 8085. 8.Describe each blocks: Registers, flag, data and address bus, Timing and control with interrupts. 9.Introduction to Addressing modes.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Number system and Binary arithmetic operations	1. Numbering concept 2. Different types of numbering system 2.1 Decimal numbers 2.2 Binary numbers 2.3 Octal numbers 2.4 Hexadecimal numbers 3. Number conversion 3.1 Decimal integer to binary and binary to decimal 3.2 Decimal fractions to binary conversion 3.3 Octal to decimal and decimal to octal conversion 4 1's complement 5 2's complement 6 Binary addition 7 Binary subtraction 8 Binary Multiplication	12
2	Concept of logic gates	1. Notations 2. Concept of gate and truth table 2.1 Inverter 2.2 OR gate 2.3 AND gate 2.4 NOR gate 2.5 NAND gate 2.6 Universal gates 3. De-Morgan's theorem	14
3	Boolean algebra and Karnaugh Map	1. Boolean relationships Simplifications 2. Sum of products (SOP)	10

		3. Product of sum (POS) 4. Algebraic simplifications	
4	Binary arithmetic and Combinational Logic	1. Half adder 2. Binary adder 3. Half subtractor 4. Full Adder 5. Full Subtractor 6. Code converters 7. Decoder 8. Encoder 9. Multiplexer 10. Demultiplexer	13
5	Introduction to Microprocessor and its components	1. Definition of Microprocessor and its applications 2. Types of Microprocessor 3. Input/output 4. Memory 5. Processing unit 5.1 Arithmetic and logical unit, control unit , Registers 6. 8085 bus structure and internal architecture 7. Pin configuration of 8085 8. Description of each blocks: Registers, flag, data and address bus, Timing and control with interrupts 9. Introduction to Addressing modes	15
	Total		**64**

5. Suggested Practical and Project Works

The practical work that students do during their course is aimed at providing them learning opportunities to accomplish competency of the curriculum as well as reinforcing their learning of the theoretical subject content. Similarly, involving in a project work fostersthe self-learning of students in the both theoretical and practical contents. As this subject emphasizes to develop both theoretical and practical knowledge and skills, some of the practical and project works are suggested for the students. However, the tasks presented here are the samples only. A teacher can assign the extra practical and project works as per the students' need or specific context.

Unit	**Grade 10**		
	Scope	**Practical Activities**	**Hrs.**
1	Number system and Binary arithmetic operations	1. Demonstrate the binary, octal, hexadecimal and decimal number system and their conversion	6
2	Concept of logic gates	1. Build logic gates, which are circuits that compute basic logical operations such as AND, OR, and NOT	18
3	Boolean algebra and Karnaugh Map	Simplify Booleanfunction using Karnaughmap	7
4	Binary arithmetic and Combinational Logic	1. Construct and investigate the operation of combinational logic circuits. 2. Create logic diagrams from a Boolean expression	15
5	Introduction to Microprocessor and its components	1. Demonstrate the basics of microcomputer system through the 8085 microprocessor trainer kit 2. Write a program that uses data transfer, arithmetic and logical instructions	18
	Total		**64**

6. Learning Facilitation Process

Learning facilitation process is determined according to the content to be dealt in the subject. It's also an art of teacher. The teacher should utilize such teaching methods and techniques that are appropriate to the contents and needs of the students. In facilitating the course, various approaches, methods and techniques are used. To be particular, the following major methods and strategies are used in this subject:

- Practical/application/experimental methods
- Laboratory based practical works
- Lecture
- Interaction
- Question answer
- Demonstrations
- Online based instructions
- Cooperative learning
- Project work methods (Research work i.e. survey and mini research, innovative work or experiential learning, connection to theory and application)

7. Student Evaluation

Evaluation is an integral part of learning process. Both formative and summative modes of evaluation are emphasized. Formative evaluation will be conducted so as to provide regular feedback for students, teachers and parents/guardians about how student learning is. Class tests, unit tests, oral question-answer, home assignment etc, are some ways of formative evaluation.

There will be separate evaluation of theoretical and practical learning. Summative evaluation embraces theoretical examination, practical examination and evaluation of research work or innovative work.

(a) Internal Evaluation

Internal evaluation covers 50 Percent weightage. Internal evaluation consists of Practical Activities (Practical works and projects works) (35 Percent), (b) Marks from trimester examinations (10 Percent), and (c) Classroom participation (5 Percent). Practical work should be based on list of activities mentioned in this curriculum. Project

works should be based on the mentioned lists or created by teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

S.N.	Mani activities	Activities in detail	Percent
1	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4	Viva	Viva of practical work and project work activities	5
6	Internal exam	First trimester 5 marks and Second trimester 5 marks	10
Total			50

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of experiment will focus both the product of work and skills competencies of student in using apparatus.

(ii) Project work assessment is the internal assessment of reports and presentation of their project works either individually or group basis. In case of group presentation, every member of the group should submit a short reflection on the presented report in their own language. Records of project works must be attested by external supervisor.

(b) External Evaluation

External evaluation of the students will be based on the written examination. It carries 50 percent of the total weightage.Questions for the external examination will be based on the specification grid developed by Curriculum Development Centre. Examination question paper will be developed using various levels of revised Bloom's taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating, creating).

Specification Grid

Grade: 10 Subjects : Digital Design and Microprocessor Time : 2 hrs.

Unit	Content	Credit hrs.	Knowledge and Understand			Application			Higher Ability			Total Question Number			Total Question	Marks Weight			Total Marks
			MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long	MCQ	Short	Long		MCQ	Short	Long	
1	Number system and Binary arithmetic operations	12	5	3	1	4	1	1	0	1	0	9	5	2	16	9	25	16	7
2	Concept of logic gates	14																	15
3	Boolean algebra and Karnaugh Map	10																	6
4	Binary arithmetic and Combinational Logic	13																	7
5	Introduction to Microprocessor and its components	15																	15
	Total	64	5	3	1	4	1	1	0	1	0	9	5	2	16	9	25	16	50