Computer Engineering syllabus

Of

grade 11 and 12

Curriculum development center (CDC) Nepal

Sanothimi, Bhaktapur Nepal

Technical and vocational education

Revised edition 2078

Practical work and project work should be based on list of activities mentioned in this curriculum or designed by the teacher. Mark distribution for practical work and project work will be as follows:

S.N.	Criteria		Elaboration of criteria	Marks
1	Participation		Classroom participation includes attendance (1) and participation in learning (2)	3
2	Practical and Project work	Laboratory experiment	Correctness of apparatus setup/ preparation	2
			Observation/Experimentation	2
			Tabulation	1
			Data processing and Analysis	1
			Conclusion (Value of constants or prediction with justification)	1
			Handling of errors/precaution	1
3.		Viva-voce	Understanding of objective of the experiment	1
			Skills of the handling of apparatus in use	1
			Overall impression	1
		Practical work records and attendance	Records (number and quality)	2
		Project work	Reports (background, objective, methodology, finding, conclusion	2
			Presentation	1
		Total Practical and project work score		**19**
3	Trimester Exam		First and second trimester's score (3+3)	**6**
Total				**25**

Note:

(i) Practical examination will be conducted in the presence of internal and external supervisors. Evaluation of laboratory 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.

- **Marks from trimester examinations**

  Total of 6 marks; 3 marks from each trimester.

- **Classroom participation (3 marks)**

  Classroom participation includes attendance (1) and participation in learning (2).

(b) External Evaluation

Out of 100 marks theoretical evaluation covers 75 marks. The tool for external evaluation of theoretical learning will be a written examination. 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 : 11 **Subject : Physics** **Time: 3 hrs.**

S.N.	Area	Working hour	Competency level				Area wise Score
			Knowledge/ Remembering	Understanding	Applying	Higher Ability	
1	Mechanics	27	MCQ (2x1) SQ (2x5)	MCQ (5 x1) SQ (1x5) LQ (1x8)	MCQ (3x1) SQ (2x5) LQ (1x8)	MCQ (1x1) SQ (3x5) LQ (1x8)	28
2	Heat and Thermodynamics	11					11
3	Wave and Optics	12					13
4	Electricity and Magnetism	18					19
5	Modern Physics	4					4
Total		72	12	18	21	24	75

Item format plan

	Type of item	Score per item	Number of items				Total item	Total Score
1	Multiple Choice Questions	1	2	5	3	1	11	11
2	Short Question Answer	5	2	1	2	3	8	40
3	Long Question Answer	8	0	1	1	1	3	24
Grand Total			**4**	**7**	**6**	**5**	**22**	**75**

Grade : 12

S.N.	Area	Working hour	Competency level				Area wise Score
			Knowledge/ Remembering	Understanding	Applying	Higher Ability	
1	Mechanics	18	MCQ (2x1) SQ (2x5)	MCQ (5 x1) SQ (1x5) LQ (1x8)	MCQ (3x1) SQ (2x5) LQ (1x8)	MCQ (1x1) SQ (3x5) LQ (1x8)	19
2	Heat and Thermodynamics	2					2
3	Wave and Optics	15					16
4	Electricity and Magnetism	20					21
5	Modern Physics	17					17
Total		**72**	**12**	**18**	**21**	**24**	**75**

Item format plan

S.N.	Type of item	Score per item	Number of items				Total item	Total Score
1	Multiple Choice Questions	1	2	5	3	1	11	11
2	Short Question Answer	5	2	1	2	3	8	40
3	Long Question Answer	8	0	1	1	1	3	24
Grand Total			**4**	**7**	**6**	**5**	**22**	**75**

Remarks:

- Item format in composite should be met as per the specification grid.
- ±1 marks variation will be allowed within the area. But cannot be nil.
- In case of 5 or 8 marks items, these should ensure that 1 mark will be assigned per element expected as correct response. However, cognitive behavior intended might not be single behavior within the item. But in total cognitive distribution should met. ±2 marks variation will be allowed within the cognitive levels.
- SQ and LQ can be structured (have two or more sub-items). SQ and LQ can be distributed to two or more cognitive behaviors. In such case these will be added to their respective cognitive behavior. In sum the distribution of cognitive behavior should be approximately to the required distribution.
- The distribution of questions based on cognitive domain will be nearby 15% knowledge/remembering, 25% understanding, 30% applying and 30% higher ability level.
- In case of short question there will be 2 "OR" questions and in case of long question there will be 1 "OR" question.

Programming in JAVA

Grade: 11 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Computer programming plays vital role to automate the world since it harnesses the computing power and control the interaction between human and computer. Thus, computer programming is important for our today's contemporary world as well as future global society. Computer programming is evolving and so are the programming languages. One of most popular language among them is Java because the language keeps evolving with its maturity. Java is platform independent and supports most common programming paradigm. Java is most recommended language for mobile app development also with its rich Application Programming Interfaces (APIs) and other many more advantages.

This course facilitates students to be competitive in today's programming world by boosting them with programming in Java. This Java course will provide students with a strong understanding of basic Java programming elements and data abstraction using problem representation and the object-oriented framework. Also, students will get idea about the basic procedural programming using java variables, arrays, loops, strings and applets. Altogether, the course comprises all the fundamentals of programming with Java. 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 concepts of object-oriented programming and fundamentals of Java.
2. Define the concept of Class and Object.

3. Demonstrate and construct Java control statements.
4. Experiment Arrays and Strings in Java.
5. Use the basic ideas of input/output and Applets in Java.

3. Grade Wise Learning Outcomes

S.N.	Content Area	Learning outcomes
1	Java Fundamental	1.1 Illustrate Java and discuss its origin and evolution. 1.2 Explain basic program structure of Java. 1.3 Illustrate and discuss objects. 1.4 Illustrate and discuss class. 1.5 Illustrate and discuss Abstraction. 1.6 Illustrate and discuss Inheritance. 1.7 Illustrate and discuss Encapsulation. 1.8 Illustrate and discuss Polymorphism.
2	Data types and variables	2.1 Describe the concept of data types. 2.2 Discuss and experiment variable and Constant. 2.3 Describe the concept of identifiers. 2.4 Illustrate keywords. 2.5 Explain access modifiers. 2.6 Illustrate and experiment escape sequence. 2.7 Discuss comments. 2.8 Explain and experiment operators.
3	Class and Object	3.1 Describe the concept of class. 3.2 Describe the concept of object. 3.3 Explain and experiment constructor. 3.4 Explain and experiment inheritance.
4	Control Statements	4.1 Describe the conditional statements: if, if else and if else if ladder, switch statements. 4.2 Illustrate loop statement and describe: while, do while, for statements 4.3 Describe about Break and continue statement.

5	Arrays	5.1 Discuss concept of array. 5.2 Describe about array types. 5.3 Construct arrays. 5.4 Experiment arrays processing. 5.5 Explain array class.
6	String	6.1 Discuss the concept of string. 6.2 Construct string. 6.3 Describe string buffer and String builder class. 6.4 Elaborate string buffer method: append(), reverse(), delete(), insert() methods. 6.5 Describe concept of string length. 6.6 Experiment the concatenate strings.
7	I/O and Java Applets	7.1 Discuss I/O stream. 7.2 Show and experiment read and write Console. 7.3 Describe the concept of applets. 7.4 Describe about embedding applet to HTML file.

4. **Scope and Sequence of Contents**

Unit	Scope	Content	Hrs.
1	JAVA Fundamentals	1.1 Introduction 1.2 Basic structure of JAVA program 1.3 Object 1.4 Class 1.5 Abstraction 1.6 Inheritance 1.7 Encapsulation 1.8 Polymorphism	11
2	Data types and Variables	2.1 Data types 2.2 Identifiers 2.3 Variables and Constant 2.4 Keywords 2.5 Access modifiers 2.6 Escape sequences	10

		2.7 Comments 2.8 Operators (arithmetic, relational, logical, assignment)	
3	Class and Object	3.1 Introduction to Class and Object 3.2 Declaration of Class and Object 3.3 Constructors 3.4 Inheritance	8
4	Control Statements	4.1 Conditional Statement 4.1.1 if 4.1.2 if else 4.1.3 if else if ladder 4.1.4 switch 4.2 Loop Statement 4.2.1 while 4.2.2 do...while 4.2.3 for 4.3 Break and Continue Statement	12
5	Arrays	5.1 Array Definition 5.2 Array Types 5.3 Array Declaration 5.4 Array Processing 5.5 Array Class	8
6	String	6.1 String Definition 6.2 String Declaration 6.3 String Buffer and String Builder Class 6.4 String Buffer Method (append(), reverse(), delete(), insert() method) 6.5 String Length. 6.6 String Concatenation	10
7	I/O and Java Applets	7.1 I/O Stream 7.2 Read and Write Console 7.3 Concept of Applets 7.4 Applets in HTML file	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 10		
	Scope	**Practical Activities**	**Hrs.**
1	OOP Concept	1.1 Demonstrate OOP concept with real time system.	6
2	JAVA Fundamentals	2.1 Java environment setup. 2.2 Installing java in computer system. 2.3 Demonstrate java compilation process. 2.4 Write a simple java program to print 'Hello Java'. 2.5 Write different programs to demonstrate different operators.	14
3	Concept of Class and Object	3.1 Simple class construction. 3.2 Defining variables and functions inside a class. 3.3 Creating an object of a class. 3.4 Accessing variables using object reference variable. 3.5 Writing a constructor function inside a class.	8
4	Control Statements	4.1 Write programs to use if, if else and if else ladder. 4.2 Write program using switch statement. 4.3 Write a program using while loop, do while loop and for loop. 4.4 Write a program using break and continue statements.	15
5	Arrays	5.1 Program to initialize array in JAVA. 5.2 Program to add two 3*3 matrices using array. 5.3 Multiply two 3*3 matrices using array. 5.4 Program to find whether the elements of an array is even or odd number.	6
6	String	6.1 Program to initialize string in JAVA 6.2 Program to compare strings 6.3 Program to reverse a string	10

		6.4 Program to concatenate two strings 6.5 Program to find the length of string	
7	I/O and Java Applets	7.1 Create I/O stream program 7.2 Embed a Java Applet to a HTML File	5
	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
5	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: 11 **Subject: Programming in JAVA** **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	JAVA Fundamentals	11	6	1	0	3	3	1	0	1	1	9	5	2	16	9	25	16	9
2	Data types and Variables	10																	7
3	Class and Object	8																	6
4	Control Statements	12																	10
5	Arrays	8																	6
6	String	10																	7
7	I/O and Java Applets	5																	5
	Total	**64**	**6**	**1**	**0**	**3**	**3**	**1**	**0**	**1**	**1**	**9**	**5**	**2**	**16**	**9**	**25**	**16**	**50**

Computer Organization and Architecture

Grades: 11 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

ComputerArchitecture is a functional description of requirements and design implementation for the various parts of computer. It deals with functional behavior of computer system. It comes before the computer organization while designing a computer. Computer Organization is how operational attribute are linked together and contribute to realize the architectural specification. This curriculum presumes that the students joining grade 11 computer Engineering stream come with diverse aspirations, some may continue to higher level studies in specific areas of computer organization and Architecture 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 computers, data representation, instruction format, memory, processor, input/output organization 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 computer, its history and parts.
2. Elaborate memory and storage device in computer.
3. Define the concept of computer processor.
4. Use the idea about input and output organization of computer.

3. Grade wise learning Outcomes

S.N.	Content Area	Learning outcomes
1	Introduction to computers	1.1 Introduce basic concept of computer. 1.2 Develop the idea of computer organization (Block diagram of Von Neumann Architecture). 1.3 Introduce to basic hardware components. 1.4 Elaborate the concept of power supply, Casing, motherboards, CPU, Chipset, real-time clock, BIOS. 1.5 Describe about different ports used in computer.
2	Data Representation	2.1 Introduce data representation. 2.2 State units of measurement (Bits, Bytes). 2.3 Describe signed number representation. 2.4 Explain floating point representation. 2.5 Introduce BCD.
3	Instruction format	3.1 Introduce instruction format. 3.2 Explain instruction types. 3.3 Explain instruction set completeness. 3.4 Describe instruction cycle.
4	Memory	4.1 Introduce memory and its types. 4.1.1 Cache memory. 4.1.2 Primary memory. 4.1.3 Secondary memory. 4.2 Describe memory hierarchy. 4.3 Describe characteristics of Memory system. 4.3 Elaborate Memory Measurement Unit. 4.4 Introduce Memory address. 4.5 Describe Error-Correcting Codes. 4.6 Explain the Memory Packaging and Types (SIMM, DIMM, RIMM). 4.7 Describe memory hierarchies. 4.8 Explain about Magnetic Disk 4.9 Introduce DVD-RW. 4.10Introduce Flash Drive.

5	Processor	5.1 Introduce Hardwired and Micro Programmed. 5.2 Explain Arithmetic and logical Unit. 5.3 Describe the types of registers. 5.4 Elaborate instruction Execution. 5.5 Describe bus architecture. 5.6 Introduce the addressing modes. 5.7 Explain about types of processor. 5.7.1 Illustrate RISC and CISC.
6	Input/ Output Organization	6.1 Introduce peripheral devices. 6.2 Describe about Basic I/O Interfaces. 6.3 Describe about I/O Technique. 6.4 Describe about I/O Processor. 6.5 Describe about I/O Ports (Serial, Parallel, HDMI, VGA, USB 2.0 and 3.0).

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to computer	1.1 Introduction to basic concept of computer. 1.2 Computer organization (Block diagram of Von Neumann and Hazard Architecture) 1.3 Introduction to basic hardware components 1.4 Power supply, Casing, motherboards, CPU, Chipset, real-time clock, BIOS 1.5 Parallel ports, serial ports, interfacing(IDE, SATA, PATA, ATAPC)	10
2	Data Representation	2.1 Introduction to data representation 2.2 Units of measurement (Bits, Bytes) 2.3 Signed number representation 2.4 Floating point representation 2.5 BCD	6
3	Instruction format	3.1 Introduction to instruction format 3.2 Instruction Types 3.3 Instruction set completeness 3.4 Instruction cycle	10

4	Memory	4.1 Introduction to memory and its types 4.1.1 Cache memory 4.1.2 Primary memory 4.1.3 Secondary memory 4.2 Memory hierarchy 4.3 Characteristics of Memory 4.3 Memory Measurement Unit 4.4 Memory address 4.5 Error-Correcting Codes 4.6 Memory Packaging and Types (SIMM, DIMM, RIMM) 4.7 Magnetic Disk (Track, Sector, Clusters, SATA, PATA) 4.8 DVD-RW 4.9 Flash Drive	12
5	Processor	5.1 Control unit -Hardwired -Micro Programmed 5.2 Arithmetic and logical Unit 5.3 Types of registers 5.4 Instruction Execution 5.5 Bus architecture 5.6 Addressing modes (Immediate Addressing, Direct Addressing, Register Addressing, Register Indirect Addressing, Indexed Addressing, Indexed Addressing and Based-Indexed Addressing) 5.7 Types of processor 5.7.1 RISC 5.7.2 CISC	14
6	Input/ Output Organization	6.1 Peripheral devices 6.2 Basic I/O Interfaces 6.3 I/O Technique 6.4 I/O Processor 6.5 I/O Ports (Serial, Parallel, HDMI, VGA, USB 2.0 and 3.0)	12
	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	Introduction to computers	1.1 Demonstration of basic computer hardware components	16
2	Memory	2.1 Developing knowledge on Components used in various memory devices 2.2 Install hard drive, CD drive and RAM 2.3 Demonstration of computer primary memory 2.4 Demonstration and identification of SIMM, DIMM, RIMM memory modules 2.5 Demonstration of different storage devices 2.6 Installing various storage devices and understanding its working mechanism 2.7 Demonstration of different storage devices 2.8 Installing various storage devices and understanding its working mechanism	26
3	Processor	3.1 Identification of computer processor in a motherboard. 3.2 Demonstrate the working procedure of processor using simulator	12
4	Input/ Output Organization	4.1 Demonstration of different input/output devices 4.2 Demonstration of different types of ports.	10
	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 following facilitation methods, techniques and strategies will be applied while conducting the teaching learning process:

- 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
5	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: 11 **Subject: Computer Organization and Architecture** **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	10	5	2	1	4	2	0	0	1	1	9	5	2	16	9	25	16	7
2	Data Representation	6																	6
3	Instruction format	10																	6
4	Memory	12																	7
5	Processor	14																	14
6	Input/ Output Organization	12																	10
	Total	**64**	**5**	**2**	**1**	**4**	**2**	**0**	**0**	**1**	**1**	**9**	**5**	**2**	**16**	**9**	**25**	**16**	**50**

Operating System

Grade: 11 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

An operating system is a program that acts as an interface between the user and the computer hardware which manages and controls the execution of all kinds of programs. This curriculum presumes that the students joining grade 11 computer Engineering stream come with diverse aspirations, some may continue to higher level studies in specific areas of operating system subject.

This curriculum comprises of fundamental conceptual principles and practices, operating system overview, types of operating system, process and process scheduling, operating System properties, deadlock and linux. 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 Operating System
2. Use types of Operating System
3. Elaborate Operating System mechanism and scheduling techniques
4. Define Operating System processing.
5. Explain deadlock occur in process of Operating System.
6. Use the Linux Operating System

3. **Grade wise learning Outcomes**

S.N.	Content Area	Learning outcomes
1	Introduction to Operating System	1.1 Introduce Operating System. 1.2 Describe Functions of an Operating System. 1.3 Explain different types of Operating System (Based on Processing method, Batch Operating System, Time sharing Operating System, Multiprocessing Operating System, Multitasking Operating System, Real time Operating System and Distributed Operating System). 1.4 Explain OS Based on User Interface (Command user Interface and Graphical user interface). 1.5 Describe OS based on Mode of user (Single user and Multiuser).
2	Process and process scheduling	2.1 Introduce Process, Program and process life cycle. 2.2 Describe Process Control block. 2.3 Explain Process state. 2.4 Introduce process scheduling . 2.5 Explain Process scheduling queues and types of Process schedulers (short term scheduler, Medium term scheduler and Long term schedule. 2.6 Illustrate the concept of Preemptive and Non-Preemptive Scheduling. 2.7 Illustrate the concept of thread and its life cycle. 2.8 Describe Algorithm: FCFS/SJF/SRT.
3	Memory Management	3.1 Introduce Memory Hierarchy. 3.2 Explain Memory function. 3.3 Describe Mono programming model and Multi programming model. 3.4 Elaborate Sharing and protection. 3.5 Describe Static and dynamic partition. 3.6 Explain Internal and External fragmentation. 3.7 Illustrate the concept of Virtual memory, Paging.

4	Deadlock Management	4.1 Introduce deadlock. 4.2 Describe Necessary Conditions for Deadlock (Mutual Exclusion, Hold and Wait, No preemption, Circular wait). 4.1 Explain Methods for handling deadlock (Deadlock Prevention, Deadlock Avoidance, Deadlock detection and Recovery from deadlock).
5	Concept of File Management	5.1 Introduce file management. 5.2 Explain File naming, File operation, File extension and File system layout. 5.3 Describe File allocation: Contiguous, Index. 5.4 Elaborate Free space management.
6	Linux	6.1 Introduce Linux Operating System. 6.2 Explain features of Linux. 6.3 Illustrate advantages and disadvantages of Linux. 6.4 Explain Linus family. 6.5 Elaborate structure of Linux and Linux Basic Commands.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to Operating System	1.1 Introduction to Operating System 1.2 Functions of an Operating System 1.3 Types of Operating System 1.3.1 Based on Processing method a) Batch Operating System b) Time sharing Operating System c) Multiprocessing Operating System d) Multitasking Operating System e) Real time Operating System f) Distributed Operating System 1.3.2 Based on User Interface -Command user Interface -Graphical user interface 1.3.3 Based on Mode of user	12

		- Single user - Multiuser	
2	Process and process scheduling	2.1 Introduction to Process and Program 2.2 Introduction to process life cycle 2.3 Process Control block 2.4 Process state 2.5 Introduction to process scheduling 2.6 Process scheduling queues 2.7 Types of Process schedulers 2.7.1 Short term scheduler 2.7.2 Medium term scheduler 2.7.3 Long term scheduler 2.8 Concept of Preemptive and Non-Preemptive Scheduling 2.9 Concept of thread and its life cycle 2.10 Algorithm: FCFS/SJF/SRT	15
3	Memory Management	3.1 Memory Hierarchy 3.2 Memory function 3.3 Mono programming model 3.4 Multi programming model 3.5 Sharing and protection 3.6 Static and dynamic partition 3.7 Internal and External fragmentation 3.8 Concept of Virtual memory, Paging	10
4	Deadlock Management	4.1 Introduction to deadlock 4.2 Necessary Conditions for Deadlock 4.2.1 Mutual Exclusion 4.2.2 Hold and Wait 4.2.3 No preemption 4.2.4 Circular wait 4.3 Methods for handling deadlock 4.3.1 Deadlock Prevention	10

		4.3.2 Deadlock Avoidance 4.3.3 Deadlock detection 4.3.4 Recovery from deadlock	
5	Concept of File Management	5.1 Introduction to file management 5.2 File naming 5.3 File operation 5.4 File extension 5.5 File system layout 5.6 File allocation: Contiguous, Index 5.7 Free space management	7
6	Linux	6.1 Introduction to Linux 6.2 Features of Linux 6.3 Advantages and disadvantages of Linux 6.4 Linux family 6.5 Difference between windows and Linux 6.6 Structure of Linux 6.7 Linux Basic Commands	10
	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 fosters the 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 11		Hrs.
	Scope	Practical Activities	
1	Introduction to Operating System	1.1 Demonstrate various Operating Systems 1.2 Operate control panel 1.3 Create new user account	26

		1.4 Installation of various Operating Systems 1.5 Partitioning and naming hard drives 1.6 Formatting hard drives 1.7 Setup bios password 1.8 Install drivers	
2	Process and process scheduling	2.1 Developing programs in c for various process scheduling techniques 2.2 Practical explanation of process life cycle 2.3 Working of process queues developing program in C	8
3	Memory Management	3.1 Demonstrate graphical display Memory Hierarchy, Mono programming model, Multi programming model 3.2 Slide presentation of Static and dynamic partition	10
4	Deadlock	4.1 Graphical display of deadlock and its detection, handling, prevention and avoidance	4
5	Linux	5.1 Installation of Linux 5.2 Execute different types of Commands in Linux 5.3 Execute basic Linux directory commands pwd,ls,cd,mkdir, rmdir 5.4 Demonstrate Linux absolute and relative paths 5.5 Demonstrate Linux files, file types and file commands file, touch, rm, cp, mv, rename and its options 5.6 Demonstrate linux basic commands for user management	16
	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
5	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: 11 **Subject: Operating 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 Operating System	12	5	2	1	4	2	0	0	1	1	9	5	2	16	9	25	16	10
2	Process and process scheduling	15																	15
3	Memory Management	10																	7
4	Deadlock Management	10																	6
5	Concept of File Management	7																	6
6	Linux	10																	6
	Total	64	5	2	1	4	2	0	0	1	1	9	5	2	16	9	25	16	50

Web & Mobile Application Development

Grades: 11 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Web application is a software system that provides a user interface through a web browser. Mobile application development is the process to making software for smart phones and digital assistants, most commonly for Android and IOS.

This curriculum comprises of fundamental conceptual principles and practices, an introduction to mobile applications, mobile operating systems, android, IOS, web applications and web application life cycle models. 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. Level-wise competencies

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

1. Develop the mobile application distribution platforms
2. Define the basic concept of mobile Operating Systems
3. Use the various mobile Operating System (Android, IOS)
4. Explain the concepts of web application development platforms
5. Elaborate web applications life cycle

3. Grade wise learning Outcomes

S.N.	Content Area	Learning outcomes
1	Introduction to mobile applications	1.1 Introduce to mobile application. 1.2 Describe the history of mobile application. 1.3 Elaborate mobile application distribution platforms.

		1.4 Illustrate the difference between mobile application and application software.
2	Mobile Operating Systems	2.1 Introduce to mobile operating software. 2.2 Illustrate the need and effectiveness of mobile Operating System. 2.3 Describe types of mobile Operating System (Android, IOS, Blackberry)
3	Android	3.1 Introduce Android. 3.2 Describe history of Android. 3.3 Explain Android versions and its features. 3.4 Describe working mechanism of Android. 3.5 Introduce Android Development Toolkit.
4	IOS	4.1 Introduce IOS. 4.2 Describe history of IOS. 4.3 Explain IOS versions and its features. 4.4 Describe working mechanism of IOS. 4.5 Introduce IOS Development Toolkit.
5	Web applications	5.1 Introduce to web applications. 5.2 Describe history web applications. 5.3 Explain platforms used for web applications. 5.4 Describe components of web applications.
6	Web application life cycle models	6.1 Introduce to life cycle of web application. 6.2 Describe about different web application life cycle models.

4. **Scope and Sequence of Contents**

Unit	Scope	Content	Hrs.
1	Introduction to mobile applications	1.1 Introduction to mobile application 1.2 history of mobile application 1.3 Mobile application distribution platforms 1.3.1 Google play 1.3.2 App store 1.3.3 Windows Store 1.3.4 Google Assistant/SIRI 1.4 Mobile application vs application software	8

2	Mobile Operating Systems	2.1 Introduction to mobile Operating System 2.2 Need and effectiveness of Mobile Operating System 2.3 Types of mobile Operating Systems 2.3.1 Android 2.3.2 IOS 2.3.3 Blackberry	12
3	Android	3.1 Introduction to android 3.2 Android versions and its features 3.3 Working mechanism of android 3.4 Introduction to Android Development Toolkit	12
4	IOS	4.1 Introduction to IOS 4.2 IOS versions and its features 4.3 Working mechanism of IOS 4.4 Introduction to IOS development toolkit	12
5	Web applications	5.1 Introduction to web applications 5.2 Platforms used for web applications 5.3 Components of web applications 5.3.1 Application server 5.3.2 Database Server 5.3.3 Web Browser 5.3.4 Connecting a web application to a database 5.4.5 Accessing and retrieving data and values from database	10
6	Web application life cycle models	6.1 Introduction to life cycle models 6.2 Life cycle models 6.2.1 Extreme Programming 6.2.2 Scrum 6.2.3 Time box development 6.2.4 Feature-driven Development	10
		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 11		Hrs.
	Scope	Practical Activities	
1	Introduction to mobile applications	1.1 Presentation on history of mobile applications 1.2 Installation of applications from Google playstore and IOS appstore and windows store 1.3 Using mobile applications	8
2	Mobile Operating Systems	2.1 Prepare document on need of Operating System in mobile 2.2 Case study on old mobile phones vs advanced mobile phones	8
3	Android	3.1 Presentation of android features 3.2 Prepare document on android various versions and its features 3.3 Understanding the android development toolkit and its usage 3.4 Writing simple program on android development toolkit	10
4	IOS	4.1 Presentation of IOS features 4.2 Prepare document on IOS various versions and its features 4.3 Understanding the IOS development toolkit and its usage 4.4 Writing simple program on IOS development toolkit	10
5	Web applications	5.1 Presentation on history of web applications 5.2 Understanding the various components of web applications 5.3 Case study on most widely used web applications 5.4 Installing a web application and exploring its functionalities	7
6	Web application life cycle models	6.1 Prepare a document on various life cycle models of web application	6

7	Project work	7.1 Develop a simple mobile application for school purpose with database	15
	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
5	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: 11 **Subject: Web & Mobile Application Development** **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 mobile pplications	8	5	2	0	4	2	1	0	1	1	9	5	2	16	9	25	16	7
2	Mobile Operating Systems	12																	10
3	Android	12																	7
4	IOS	12																	12
5	Web applications	10																	6
6	Web application life cycle models	10																	8
	Total	**64**	**5**	**2**	**0**	**4**	**2**	**1**	**0**	**1**	**1**	**9**	**5**	**2**	**16**	**9**	**25**	**16**	**50**

Visual Programming

Grade :12 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Technology has evolved directly proportional with time. The technology of yesterday is an obsolete today. The world has become dependent of technology in each and every field and ICT's Prevalence and dominance is increasing day by day. Therefore, Computer education relevance has been increasing day by day. The study of this Course will help students to maximum use of technology and succeed them in their professional life.

The visual programming using c# syllabus aims to help the students on computer programming language concept. The end goal is to develop basic programming knowledge and skills with the concept of variables, data types, control structure, loop, arrays, strings, pointers and working with database etc. This subject covers the basic needs of students for learning the latest programming languages. 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.

1. Competencies

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

1. Develop the features of C#.NET
2. Define real-world applications of these languages
3. Use structures, pointers, arrays, control statements in C#.NET
4. Describe the concept of data types, operators, keywords in C#.NET

3. Grade Wise Learning Outcomes

SN	Content Area	Learning Outcomes
1	Introduction to C#.NET	1.1 Introduce C# its features and applications. 1.2 Introduce the structure of C#. 1.3 Analyze the variables of C#. 1.4 Describe the Identifiers of C#. 1.5 Introduce the keywords of C#. 1.6 Explain data types in C#. 1.7 State the C# type conversion. 1.8 Introduce to C# operators.
2	Control statements	2.1 Introduce the control statements. 2.2 Demonstrate if ,if else and if else ladder and compute it. 2.3 Demonstrate the switch statement and its functions. 2.4 Illustrate the for loop and deduce its usage. 2.5 Illustrate the do while loop and deduce its usage. 2.6 Illustrate the while loop and deduce its usage. 2.7 Classify loop control statements and compare its features.
3	Arrays	3.1 Introduce the arrays and its usage. 3.2 Demonstrate the declaration and initialization of array. 3.3 Illustrate the data access from an array. 3.4 Introduce to multidimensional arrays. 3.5 Compare and deduce the applications of jagged arrays, param arrays, and array class.
4	Strings	4.1 Introduce the strings, its usages and functions. 4.2 Demonstrate the creation of an string object. 4.3 Demonstrate the methods of string class and deduce its usages. 4.4 Introduce to string functions and Examine the usage of functions.
5	Structures	5.1 Introduction to structure, its features and its necessities. 5.2 Demonstration of Defining of structure and its usage. 5.3 Compare and evaluate class vs structure and demonstrate it.

6	Pointers	6.1 Introduce the pointers, its features and its applications. 6.2 Differentiate between advantages and disadvantages of pointers. 6.3 Demonstrate the access of data value using pointer. 6.4 Illustrate the passing of pointers as parameters to methods. 6.5 Demonstrate the access of array elements using a pointer.
7	Working with database	7.1 Introduce the database, its features and necessity in programming environment. 7.2 Demonstrate the Database environment setup and configure the requirements. 7.3 Illustrate the connection of C# program with database. 7.4 Demonstrate the Read and write operations from the database.

4. Scope and Sequence

Unit	Scope	Content	Hrs.
1	Introduction to C#.NET	1.1 Introduction to C#.net 1.2 Development of C# net 1.3 Introduction to C#.net and its features 1.4 Structure 1.5 Variables 1.6 Identifiers 1.7 Keywords 1.8 Data types 1.9 Type conversion 1.10 Operators	10
2	Control statements	2.1 Introduction to control statements 2.2 If , if else and if else ladder 2.3 Switch statement 2.4 For loop 2.5 Do while loop 2.6 While loop 2.7 Loop control statements	10

3	Arrays	3.1 Introduction to array 3.2 Declaration and initialization of array 3.3 Accessing data from an array 3.4 Multi-dimensional arrays 3.5 Jagged arrays, param arrays and array class	8
4	Strings	4.1 Iintroduction to strings 4.2 Creating an string object 4.3 Methods of string class 4.4 String functions	8
5	Structures	5.1 Introduction to structure 5.2 Defining a structure 5.3 Features of C# structure 5.4 Class vs. structure	10
6	Pointers	6.1 Introduction to Pointers 6.2 Advantages and disadvantages of pointers 6.3 Retrieving the data value using a pointer 6.4 Passing pointers as parameter to methods 6.5 Accessing array elements using a pointer	10
7	Working with database	7.1 Need of database in C# 7.2 Database environment setup 7.3 connecting a C# program with database 7.4 Reading and writing elements to and from the database	8
		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	Scope	Activities	Hrs.
1	Introduction to C#.NET	1.1 Presentation on C#.NET 1.2 Installation of programming environment	16

		1.3 Installation of Microsoft Visual Studio	
2	Control statements	2.1 Program using if statements 2.2 Program using if else statement 2.3 Program using nested if else 2.4 Program using switch statements 2.5 Program using for loop 2.6 Program using while loop 2.7 Program using do while loop 2.8 Program using break and continue	12
3	Arrays	3.1 Program to declare arrays 3.2 Program to read elements from an array 3.3 Program to add two matrixes 3.4 Program to multiply two matrixes	10
4	Strings	4.1 Program using various C# string functions	5
5	Structures	5.1 Simple C# program using structure	8
6	Pointers	6.1 Simple C# programs using pointers	8
7	Working with database	7.1 program to connect C# with database 7.2 accessing and retrieving data and values from database	5
		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
5	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: 12 **Subject: Visual Programming** **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 C#.NET	10	4	2	0	5	2	1	0	1	1	9	5	2	16	9	25	16	7
2	Control statements	10																	9
3	Arrays	8																	6
4	Strings	8																	6
5	Structures	10																	7
6	Pointers	10																	6
7	Working with database	8																	9
	Total	64	4	2	0	5	2	1	0	1	1	9	5	2	16	9	25	16	50

Computer Network

Grade: 12 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

The world has turned into a small globe due to the advancement of technology. The technology has advanced in such a way no sector/field is out of reach. The world has become dependent of technology and Computer network has become the most prominent thing that has reached each and every corner of the world. Internet is a network of computers and it has dominated all the others applications of technology. So the knowledge of computer network has become necessity for day to day learning. The study of this course will help young minds of Nation to maximum use of technology and succeed them in professional life.

This curriculum aims to help the students on fundamental concept of computer network. The curriculum comprises of introduction to computer network, Network types and topologies network protocols, networking devices, workgroup computing, network architecture theoretically and practically it focuses on setup of topologies, configuration of protocols, Workgroup computing development and configuration and development of network architecture. 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 concepts of computer networking
2. Use the different types of network, network topologies and network protocols
3. Design Network architecture
4. Demonstrate the various networking devices

5. Elaborate the workgroup computing
6. Apply network security threats and preventions.

3. Grade Wise Learning outcomes

SN	Content Area	Learning Outcomes
1	Introduction to computer Network	1.1 Introduce the computer network and its features 2.1 Illustrate advantages and disadvantages of computer network 2.3 Illustrate the applications of computer network and associate with daily learning
2	Network Types and topologies	2.1 Analyze the requirement of network division 2.2 Introduce the types of network their features 2.3 Introduce the local area network with features and applications 2.4 Introduce the Metropolitan area network with features and applications 2.5 Introduce the wide area network with features and applications 2.6 Contrast the need of various topologies and its types 2.7 Introduce Bus topology with its features, applications and diagram 2.8 Introduce Ring topology with its features, applications and diagram 2.9 Introduce Star topology with its features, applications and diagram 2.10 Introduce Mesh topology with its features, applications and diagram
3	Networking Devices and Transmission media	3.1 Introduce to various networking devices and tools 3.2 Introduce to Transmission media 3.3 Introduce to Bounded media, its advantages, disadvantages, its types and applications 3.4 Introduce to Unbounded media, its advantages, disadvantages, its types and applications

4	Network Architecture	4.1 Introduce network architecture its features and applications 4.2 Classify the types of network architectures 4.3 Introduce the domain based client server architecture and demonstrate it with advantages disadvantages and components 4.4 Introduce the peer to peer network and demonstrate it with advantages, disadvantages and components 4.5 Elaborate the concept of centralized and decentralized network.
5	Reference Model and IP addressing	5.1 Introduce to Reference model 5.2 Compare OSI and TCP/IP model 5.3 Introduce Network protocols and its features needs and application 5.4 Introduce to IP address and its class, division of range of IPv4 with class and its applications 5.5 Contrast between IPV4 and IPV6 5.6 Introduce to Sub netting and its usage 5.7 Introduce IPV 6
6	Workgroup Computing	6.1 Introduction to workgroup computing 6.2 Explain component of workgroup 6.3 Explain types of Workgroup computing 6.4 Illustrate advantage and disadvantage of workgroup 6.5 Explain application of workgroup
7	Network Security	7.1 Introduce to network security 7.2 Explain the types of network security 7.3 Illustrate Firewall protection, E-Mail, Antivirus, Virtual Private Network, etc. 7.4 Illustrate common network security threats

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to computer Network	1.1 Introduction to computer network 1.2 Advantages and disadvantages of computer Network 1.3 Applications of computer Network	4

		1.4 Simple Mail Transfer Protocol(SMTP) 1.5 HTTP 1.6 POP 1.7 IP address and its class 1.8 IPV4 Addressing 1.9 Sub netting 1.10 Introduction to IPV6	
2	Network Types and topologies	2.1 Introduction to network types 2.2 Types of Network 2.2.1 Local Area Network 2.2.2 Metropolitan Area Network 2.2.3 Wide Area Network 2.3 Topology introduction 2.4 Types of Network Topologies 2.4.1 Bus Topology 2.4.2 Ring Topology 2.4.3 Star Topology 2.4.4 Mesh Topology	10
3	Network Devices and Transmission media	3.1 Introduction to various Network devices and Tools 3.2 Introduction to Transmission media 3.3 Types of transmission media 3.3.1 Bounded media 3.3.2 Unbounded media 3.4 Transmission modes	10
4	Network Architecture	4.1 Introduction to Network Architecture 4.2 Types of Network Architecture 4.2.1 Client Server Architecture 4.2.2 Peer to peer Network Architecture 4.3 Client server Architecture advantages and disadvantages 4.4 Peer to peer architecture advantages and disadvantages 4.5 Centralized and Decentralized Network	8

5	Reference model and IP Addressing	5.1 OSI reference model 5.2 TCP/IP reference model 5.2 Introduction to protocols 5.2.1 Point to Point Protocol(PPP) 5.2.2 Internet Protocol (IP) 5.2.3 Transmission Control Protocol(TCP) 5.2.4 File Transmission Protocol(FTP)	14
6	Workgroup Computing	6.1 Introduction to workgroup 6.2 Components of workgroup 6.3 Types of workgroup 6.4 Advantages and Dis-advantages of workgroup 6.5 Application of workgroup	6
7	Network Security	7.1 Introduction to Network security 7.2 Types of network security 7.2.1 Firewall Protection 7.2.2 Email security 7.2.3 Anti-virus and Anti-malware software 7.2.4 Virtual Private Network 7.2.4 Network Access control - Authentication - Authorization - Accountability 7.3 Common Network Security Threats 7.3.1 Virus 7.3.2 Trojan horse 7.3.3 Computer Worm 7.3.4 Phishing Attacks	12
	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 fosters the 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 12		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to computer Network	1.1 Make a presentation about the impact of computers in our daily life	6
2	Network Types and topologies	2.1 Physical configuration of LAN in a LAB 2.2 Implement the Bus and Ring topology in the LAB	8
3	Networking Devices and Transmission media	2.1 Understand the color coding standard of UTP cable 2.2 Implement the cross-wired cable and straight through cable using clamping tool 2.3 Understand the physical and practical knowledge of the network devices (repeater, hub, router, bridge, UPT, fiber cable)	12
4	Network Architecture	4.1 Configure peer to peer networking 4.2 Create the logical diagram of client server Architecture 4.3 Implementing client server architecture model	14
5	Reference model and IP addressing	5.1 Configuring private IP address of class C 5.2 Observe Static and Dynamic Routing 5.3 Installing external NIC card	10
6	Workgroup Computing		
7	Network Security	7.1 Understand and implement (threat Detection, Data Backup, Password Policy, Authentication)	14
	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
5	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: 12 **Subject: Computer Network** **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 Network	4	6	2	1	3	1	1	0	2	0	9	5	2	16	9	25	16	2
2	Network Types and topologies	10																	7
3	Network Devices and Transmission media	10																	7
4	Network Architecture	8																	6
5	Reference model and IP Addressing	14																	13
6	Workgroup Computing	6																	6
7	Network Security	12																	9
	Total	64	6	2	1	3	1	1	0	2	0	9	5	2	16	9	25	16	50

Contemporary technology

Grade: 12 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

The evolution of technology is growing day by day. With advancement of Technology advanced mechanisms have been implemented to make daily activities easier and faster with very less effort with use of technology. The technologies that are dominant due to technology and presently available is known as contemporary technology. So for advanced learning and use of technology the knowledge of contemporary is mandatory.

The curriculum aims to help the students on fundamental concept of contemporary technology. The curriculum comprises of introduction to contemporary technology, E-Commerce and its components and government policies, cloud computing its components and government policies, E-Governance and its components and government policies, IOT and its components and government policies, robotics and its applications, multimedia and its types, big data and its necessities. 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

1. Develop the various technologies emerging in the world
2. Define the concept of E-Commerce and its uses
3. Application E-Governance and E-Medicine
4. Familiar with E-Learning
5. Describe basic concept of robotics and its applications
6. Use of multimedia

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

3. Grade wise Learning Outcomes

SN	Content Area	Learning outcomes
1	Introduction to contemporary technology	1.1 Introduce contemporary technology. 1.2 Describe the need and effectiveness of Contemporary Technology. 1.3 Analyze the applications of Contemporary technology. 1.4 Differentiate advantages and disadvantages of contemporary technology. 1.5 Compare the changes brought by present used contemporary technologies.
2	E-Commerce	2.1 Introduce the E-Commerce. 2.2 Introduce the components of E-Commerce and their roles. 2.3 Describe the types of E-Commerce and its applications. 2.4 Analyze the Scope of E-Commerce in Nepal and Governments policy and steps in implementation of E-Commerce.
3	E-Governance	3.1 Introduce the E-Governance. 3.2 Introduce the components of E-governance. 3.3 Analyze the scope of E-governance in Nepal and Governments policy and steps in implementation of E-governance.
4	Cloud Computing and Internet of Things (IOT)	4.1 Introduce the Cloud Computing. 4.2 Introduce the features and components of Cloud Computing. 4.3 Know classification of Cloud Computing. 4.4 Analyze the scope of Cloud Computing in Nepal and Governments policy and steps in implementation of Cloud Computing. 4.5 Introduce the IoTfeatures. 4.6 Introduce the components of IoT. 4.7 Analyze the scope of IoT in Nepal and Governments policy and steps in implementation of IoT.
5	AI	5.1 Introduce AI, its history and its needs. 5.2 Identify the area of AI. 5.3 Advantages of AI. 5.4 Demonstrate robotics and applications of robotics in Nepal. 5.5 Analyze the government policies and steps in implementation of AI in robotics.

6	Multimedia	6.1 Introduce the multimedia, its features. 6.2 Contrast the advantages of multimedia. 6.3 Describe the components of multimedia and its standard format of representation. 6.4 Demonstrate the applications of Multimedia and its present practices.
7	Big Data	7.1 Introduce big data and its need and applications. 7.2 Describe the characteristics of big data. 7.3 Describe the challenges of Big data. 7.4 Describe advantages of big data. 7.5 Compare the types of Big data with examples. 7.6 Introduce the Hadoop framework.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to contemporary technology	1.1 Contemporary technology definition 1.2 Need of contemporary technology 1.3 Applications of contemporary technology 1.4 Contemporary technology Advantages 1.5 Presently used Contemporary technologies	10
2	E-Commerce	2.1 E-Commerce definition 2.2 Components of E-Commerce 2.3 Types of E-Commerce 2.4 Applications of E-Commerce 2.5 Advantages of E-Commerce 2.6 Scope of E-commerce in Nepal 2.7 Government's steps in implementation of E-Commerce in Nepal	8
3	E-governance	3.1 E-Governance Definition 3.2 Components of E-Governance 3.3 Advantages of E-governance 3.4 Scope of E-governance in Nepal 3.4 Government's steps in implementation of E-governance in Nepal	8

4	Cloud Computing and Internet of Things (IOT)	4.1 Cloud Computing definition 4.2 Features and Components of cloud computing 4.3 Classification of cloud computing 4.4 Scope of cloud computing in Nepal 4.5 IoT and its features 4.6 IoT Components 4.7 Types Of IoT Wireless Networks	14
5	AI	5.1 AI Introduction 5.2 Area of AI 5.3 Advantages of AI 5.4 Application of AI 5.4 Scope of AI in Nepal 5.5 Government's steps in promotion of AI in robotics and technology.	`10
6	Multimedia	6.1 Multimedia Introduction 6.2 Advantages of Multimedia 6.3 Components of Multimedia 6.4 Applications of Multimedia	6
7	Big Data	7.1 Introduction 7.2 Characteristics of Big data 7.3 Challenges of Big Data 7.4 Advantages of Big data 7.5 Types of Big data 7.6 Example of big data 7.7 Introduction to Hadoop	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 12		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to contemporary technology	1.1 Make a slide about Contemporary technology	4
2	E-Commerce	2.1 Prepare a slide on a topic "Current trends of E-Commerce in Nepal" and demonstrate in your class as a group work. 2.2 Collect the names, logo and other related information of different Nepalese E-Commerce Website and demonstrate in a sheet of chart paper. 2.3 Explore the below e-commerce sites and browse the different parts and prepare a small report. a) Ebay.com b) Flipcart.com c) Snapdeal.com d) daraz.com.np e) sastodeal.com f) hamrobazaar.com g) Amazon.com h) khalti.com.np	12
3	E-governance	3.1 Prepare a presentation file on a topic "E-Governance" and demonstrate. 3.2 Prepare an article on "E-Governance in Nepal". Using the Internet, find some information about the topic and include in your article and also mention the name of the website you visited.	8
4	Cloud Computing and Internet of Things (IOT)	4.1 Prepare a presentation file on a topic "Examples of Services over Cloud" and demonstrate in your class. 4.2 Explain " three basic types of cloud computing services " in a sheet of chart paper with figures. 4.3 Prepare a presentation file on a topic "Internet of Things (IoT) with example" and demonstrate in your class	12

5	AI	5.1 Prepare a presentation file on a topic "Sophia Robot in Nepal" and demonstrate in your class. 5.2 Prepare on latest invention on AI and demonstrate.	10
6	Multimedia	6.1 Prepare a presentation file on a topic "Multimedia and its Application" and demonstrate. 6.2 Prepare multimedia presentation on "Internet and its application"	10
7	Big Data	7.1 Prepare a presentation file on a topic "Big Data" and demonstrate in your class. 7.2 Prepare a presentation file on a topic "Big Data for Cyber-security"and demonstrate in your class.	8
	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 following facilitation methods, techniques and strategies will be applied while conducting the teaching learning process:

- 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
5	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: 12 **Subject: Contemporary technology** **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 contemporary technology	10	5	2	0	4	1	1	0	2	1	9	5	2	16	9	25	16	7
2	E-Commerce	8																	6
3	E-governance	8																	6
4	Cloud Computing and Internet of Things (IOT)	14																	14
5	AI	10																	9
6	Multimedia	6																	2
7	Big Data	8																	6
	Total	64	5	2	0	4	1	1	0	2	1	9	5	2	16	9	25	16	50

Software engineering and project

Grade: 12 **Credit hrs: 4** **Working hrs: 128**

1. Introduction

Software has become an integral part for operation of hardware and other activities performed on the computer. The use of software has made complex calculations and other activities as simple as blink of an eye. The advancement of technology has brought advancement in software too. The evolution of new software with user friendly nature and graphical user interface has made human life dependent of computer. So government of Nepal has realized its importance for the development of Computer Sector in Nepal and Outsourcing of Software technology for expanding economy of country. The study of this course will help students to learn about software, its types , development models enhancing success in professional life.

This curriculum aims to help the students on fundamental concept of Software engineering leading to the development of project. The curriculum comprises of project introduction, introduction on project topics, project management techniques, software development life cycle, software development models, software analysis and design tools. 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 introduction of project
2. Demonstrate the different project topics
3. Use the various project management techniques
4. Introduce the Software development life cycle

5. Analysis various software development models
6. Use of software analysis and Design tools

3. Grade wise Learning Outcomes

SN	Content Area	Learning Outcomes
1	Introduction to Software Engineering	1.1 Introduce the Software Engineering and its importance. 1.2 Describe the applications of Software Engineering.
2	Project management techniques	2.1 Introduce project development techniques. 2.2 Introduce PERT and its implementation. 2.3 Introduce CPM and its implementation. 2.4 Demonstrate the implementation of project management techniques in real world.
3	Software Development life cycle	3.1 Illustrate the importance and need of SDLC. 3.2 Describe the system development phases. 3.3 Elaborate System Study. 3.4 Elaborate the feasibility study and its types. 3.5 Describe the System Analysis. 3.6 Describe the System Design. 3.7 Describe the System Development. 3.8 Demonstrate the System Testing. 3.9 Illustrate the System implementation. 3.10 Describe the system Maintenance and reviews.
4	Software Development Model	3.1 Introduce Waterfall model, its steps, features, applications and its advantages & disadvantages. 3.2 Introduce prototyping model, its steps, features, applications, and advantages &disadvantages. 3.3 Introduce to Spiral model, its steps, features, applications, and advantages &disadvantages. 3.4 Introduce to RAD(Rapid Application Development) model, its steps, features, applications, and advantages &disadvantages.

5	Software Analysis and Design Tools	5.1 Introduce the Dataflow diagram and ER Diagram. 5.2 Introduce the Structure Chart. 5.3 Introduce the Decision Table. 5.4 Introduce the Decision Tree. 5.5 Illustrate Use case Diagram and Sequence Diagram.
6	Project Work	6.1 Introduce web page development. 6.2 Elaborate the concept of game development. 6.3 Introduce Mobile application and development. 6.4 Elaborate software protection system. 6.5 Introduce E-learning platform.

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1	Introduction to Software Engineering	1.1 Software Engineering Definition 1.2 Importance of Software Engineering 1.3 Applications of Software Engineering	8
2	Project management techniques	2.1 Introduction to project development techniques 2.2 PERT introduction and implementation 2.3 CPM introduction and implementation 2.4 Implementation of project management techniques in real world	8
3	Software Development Phases	3.1 Importance and need of SDLC 3.2 System Study 3.3 Feasibility study and its types 3.4 System Requirements & Analysis 3.5 System Requirements Specification (SRS) 3.6 System Design 3.7 System Development 3.8 System Testing 3.9 System implementation 3.10 System Maintenance and reviews	14

4	Software Development life cycle Models	4.1 Waterfall Model 4.2 Prototyping Model 4.3 Spiral Model 4.4 RAD Model	8
5	Software Analysis and Design Tools	5.1 Dataflow diagram(DFD), ER Diagram 5.2Structure Chart 5.3 Decision Table 5.4 Decision Tree 5.5 Use case Diagram 5.6 Sequence Diagram	10
6	Project Work	6.1 Web page development 6.2 Game development 6.3 Mobile application development 6.4Software Piracy Protection System 6.5e-Learning Platform	16
		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 12**		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction to Software Engineering	1.1 Demonstrate the concept of Software Engineering	2
2	Project management techniques	2.1 Demonstrate the Project Management technique using CPM & PERT 2.2 Design the GANTT chart	4
3	Software Development life cycle Models	3.1 Demonstrate the selection of appropriate SDLC models on the basis of project	4

4	Software Development Phases	4.1 Illustrate the importance of Feasibility study before the development of project 4.2 Develop requirement specifications of a problem (SRS) 4.3 Familiarization with the testing tools like JUNIT	12
5	Software Analysis and Design Tools	5.1 Develop DFD model (Level 0 , Level 1 DFD Model) of a College Management System 5.2 Develop the Structured Design for the DFD model design in 1	12
6	Project Work	6.1 Develop a simple Web Page for your college 6.2 Demonstrate the concept of Game development and tools required 6.3 Illustration of Mobile application development and tools required 6.4 Make a presentation on software piracy protection system 6.5 Make a presentation on E-learning platform	30
	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

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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

5	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.

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Specification Grid

Grade: 12 **Subject: Contemporary technology** **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	
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2	Project management techniques	8																	6
3	Software Development Phases	14																	14
4	Software Development life cycle Models	8																	7
5	Software Analysis and Design Tools	10																	7
6	Project Work	16																	9
	Total	64	6	3	0	3	2	1	0	0	1	9	5	2	16	9	25	16	50