Secondary Level School Curriculum

(Technical and Vocational Stream)

(Grade 9-10)

Plant Science

2078

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

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Preface

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

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

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

Curriculum Development Centre

Sanothimi, Bhaktapur

Content

S/No. **Subjects** **Page No.**

Curriculum Structure

Class 9-10

क्र.सं.	कक्षा ९			कक्षा १०		
	विषय	पाठ्यघण्टा Credit Hrs.	वर्षिक कार्यघण्टा	विषय	पाठ्यघण्टा Credit Hrs.	वर्षिक कार्यघण्टा
१	नेपाली	४	१२८	नेपाली	४	१२८
२	अङ्ग्रेजी	३	९६	अङ्ग्रेजी	३	९६
३	गणित	३	९६	गणित	३	९६
४	विज्ञान	३	९६	विज्ञान	३	९६
५	सामाजिक	३	९६	सामाजिक	३	९६
६	Agriculture Extension and Computer Science	४	१२८	Industrial Agriculture and fish Culture	४	१२८
७	Principle of Agronomy	४	१२८	Food Crop Production	४	१२८
८	Basic Horticulture	४	१२८	Horticultural Crop Production	४	१२८
९	Plant Protection	४	१२८	Floriculture and Nursery Management	४	१२८
	जम्मा	३२	१०२४		३२	१०२४

Agriculture Extension and Computer Science

Grade: 9 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

Extension education provides awareness about social systems and values, gender equity and social inclusion, dissemination of technical knowledge, etc.to the student while applying agriculture extension for community development. This course provides opportunity to understand the basic concept of education and extension education, their principle, philosophy, objective, method, system and practices etc. and apply the agriculture knowledge to the farming community. Extension education disseminates the new technology to the needy people. Similarly, computer science curriculum aims to develop awareness of how do the computers work and how they are used in the school, workplace, at home, andin the community.

This curriculum comprises the fundamental principles and practices, an introduction, communication, basic sociological concept, extension program planning, monitoring and evaluation, group and rural leadership, gender and development, introduction to computer, computer operating system, application of software, computer networks and topologies, internet and electronic mail (Email). The subject matters will be delivered using both the conceptual and practical inputs through presentation, discussion, reflective readings and group works as along with the 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 learning 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 systematically.

3. Competencies

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

1. Acquire general knowledge and skills of agriculture extension in Nepalese context
2. Explain the role of extension worker, social system/norms/values and gender

concept

3. Apply agriculture extension for the agricultural promotion in the country
4. Describe the importance of farmers' organizations and groups for agriculture and community development
5. Develop a sense of information technology culture and appreciate the range and power of computer applications
6. Develop an awareness of how computers work and how they are used in the school, workplace, at home and in the community
7. Appreciate the role of computers in the everyday life and the impacts on society and the people
8. Use common computer software to accomplish the assigned tasks

3. Grade wise Learning Outcomes

Section A (Agriculture Extension)		
S.N.	**Content Area**	**Learning outcomes**
1.	Introduction	1.1. Define extension education 1.2. Discuss the importance of education in our context 1.3. Define the formal and non-formal education 1.2. Explain the objective and importance of extension education 1.4. Point out the role of extension in agriculture development
2.	Communication	2.1. List out the steps in extension teaching-learning process 2.2. Describe the method of communication (individual, group and mass) 2.3. Define RRA and PRA 2.4. Explain the role of extension worker in transfer of technology
3.	Basic sociological concept	3.1. Define sociology and rural sociology 3.2. Discuss terminologies related to sociological point of view 3.3. Discuss the concept and history of social mobilization

		in Nepal 3.4. Discuss the objective of social mobilization in extension process
4.	Extensionprogramplanning, monitoring and evaluation	4.4.Define program planning 4.5.State the principles and importance of program planning 4.6.Differentiate between monitoring and evaluation 4.7.Discuss on diffusion and adoption process 4.8.Meaning and importance of need-based training
5.	Group and rural leadership	5.1.Define group 5.2.Explain the procedure of group formation and discuss its role in extension 5.3.Understand the concept of cooperatives clearly 5.4.Explain the types of leader 5.5.State the characteristics of a good leader 5.6.Define motivation 5.7. Explain the factors affecting motivation
6.	Gender and development	6.1.Introduce the gender concept, gender segregation, stratification and discrimination 6.2.Differentiate between gender equity and equality 6.3.Identify gender needs and state its importance in rural context 6.4.Discuss the role of gender in development 6.5.Clear the concept of WID, WAD, GAD
	Section B (Computer Science)	
7.	Introductiontocomputer	7.1.Illustrate the computer system: its hard and software 7.2.Get familiarized with the with the history of computer 7.3.Understand the capabilities and limitations of computers and their applications 7.4.Explain different types of computers on the basis of data and size 7.5.Describe the generations of computers with their features

8.	Computersystem	8.1.Get familiarized with all the hardware parts of computer 8.2.Describe the basic components of a computer system (input, output, processor and storage) 8.3.Illustrate the concept of RAM and ROM) 8.4.Illustrate different storage devices of computer 8.5.Explain computer software with their types
9.	Operating system	9.1.Introduce operating system 9.2.Describe GUI with its feature 9.3.Introduce open-source operating system with examples
10.	Multimedia	10.1.Introduce multimedia 10.2.Describe the component of multimedia. (text, audio, video, image, animation) 10.3.Describe and demonstrate the applications ofmultimedia
11.	Computer net works and topologies	11.1. Illustrate computer networks 11.2. Describe the types of networks (LAN, MAN, WAN) 11.3. Explain different types of topologies 11.4. Discuss the use of communication in daily life
12.	Internet and itsapplication	12.1. Introduce internet 12.2. Define web browser, website, web page, home page, search engine and email 12.3. Illustrate/describe the application of internet: 12.3.1 Search engine 12.3.2 Email 12.3.3 E-commerce 12.3.4 E-banking 12.3.5 E-governance

4.Scope and Sequence of Contents

Section A (Agriculture Extension and communication)			
Unit	**Scope**	**Content**	**Hrs.**

1.	Introduction	1.1. Introduction to education, formal and non-formal education and their importance in our context 1.2. Definition, objective and importance of extension education 1.3. Role of extension in agriculture development 1.4. History of agriculture extension in Nepal.	4
2.	Communication	2.1. Concept and steps in extension teaching-learning process 2.2. Method of communication (individual, group and mass) 2.3. Role of extension education in transfer of technology	4
3.	Basic sociological concept	3.1. Definition and importance of sociology and rural sociology 3.2. Terminologies related to sociological theories and practices: family, group, community, social structure, social custom, social norms and values, social process, social culture and belief, institution, social stratification (i.e. caste, class, gender, age), society and socialization 3.3. Concept and history of social mobilization in Nepal 3.4. Objective of social mobilization in extension	5
4.	Extensionprogramplanning, monitoring and evaluation	4.1. Principles and importance of program planning 4.2. Program monitoring and evaluation 4.3. Meaning of diffusion and adoption	3

5.	Group and rural leadership	5.1. Concept, principle and types of group 5.2. Procedure of group formation and its role in extension 5.3. Meaning and types of leader and leadership 5.4. Characteristics of a good leader 5.5. Meaning of motivation and factors affecting motivation	5
6.	Gender and development	6.1. Introduction to gender concept: gender segregation, and discrimination 6.2. Identifying the gender needs and its importance in rural context 6.3. Role of gender in development 6.4. Concept of WID, WAD, GAD	6

Section B (Computer Science)			
Unit	**Scope**	**Content**	**Hrs.**
7.	Introductiontocomputer	7.1. Concepts of computer and its application. 7.2. History of computer 7.3. Capabilities and limitation of computers 7.4. Types of computers (data: analog, digital, hybrid); (size: micro, mini, mainframe and super) 7.5. Generations of computers and their features	4
8.	Computersystem	8.1. Familiar with all hardware parts with CPU of computer and dismantle 8.2. Basic components of a computer system (input, output, processor and storage) 8.3. Memory (primary and secondary, RAM, ROM) 8.4. Storage devices: magnetic tape, magnetic disks: Hard disk and floppy disks (winchester disk), optical disks: CD, VCD, CD-R, CD-RW,	6

		DVD, DVD-RW, blue ray disc, flash drives, SD/MMC memory cards	
9.	Operatingsystem	9.1. Introduction of operating System 9.2. Windows operating system, introduction to GUI and its feature working with a window environment and window application program 9.3. Introduction to open sources operating system with examples	6
10.	Multimedia	10.1. Introduction to multimedia 10.2. Components of multimedia(text. audio. video, image, animation) 10.3. Application of multimedia	9
11.	Computer networks and topologies	11.1. Introduction of computer networks and topologies 11.2. Types of networks (LAN, MAN, WAN,) 11.3. Topologies of LAN (ring, bus, star, mesh and hybridtopologies) 11.4. Use of communication in daily life	6
12.	Internet and itsapplication.	12.1 Introduction to internet. 12.2. Introduction to web browser, website, web page, home page 12.3. Application of internet 12.3.1. Search engine 12.3.2. Email 12.3.3. E-commerce 12.3.4. E-banking 12.3.4. E-governance	6
Total			**64**

5. Suggested Practical and Project Works

Practical and project worksaretheintegral 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 of this subject are mentioned below. As these are the fundamental practical and project works, the teacher can adapt or introduce more practical works relevant to their context and students' needs.

Unit	Grade 9		
	Section A (Agriculture Extension)		
	Scope	**Practical Activities**	**Hrs.**
1.	Introduction	1. Identify and prioritize the farmers' problems by using PRA/RRA	5
2.	Communication	2. Practices on the development of visual aids such as posters, charts, pamphlets, flash cards and graphs	6
3.	Basic sociological concept	3. Learn to develop questionnaire to generate quantitative information from the farmers	8
4.	Extensionprogramplanning, monitoring and evaluation	**4.** Conduct impact study of rural and community development program in Nepal	7
5.	Group and rural leadership	**5.** Interview with successful farmers' group to find out leadership skills	7
6.	Gender and development	**6.** Differentiate between the changes in women farmer's group before and after involving in new production activity.	6
	Section B (Computer Science)		
7.	Introductiontocomputer	7. Visit to computer lab and identify different devices.	3
8.	Computersystem	**8.** Identify different hardware of computer	3

9.	Operatingsystem	9. Work with GUI and its feature working with a window environment and window application program	3
10.	Applicationof software	10. Install various application software like MS office and utility software like antivirus	3
11.	Computer networks and topologies	11. Work with Microsoft office package especially word, excel and power point.	8
12.	Internet and electronic mail (Email)	12. Create gmail, yahoo or hot mail account and download e-books, PDF files related to computers using internet	5
Total			**64**

6. Learning Facilitation Process

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

- Class room instruction
- Group discussion
- Demonstration
- Problem solving
- Presentation
- Case study
- Visual(chart) preparation

- Practical works
- Project works
- Field study
- Group works and pair works
- Exploration and explanation

7. Student' Evaluation

Evaluation is an integral part of the 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 going on. 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 carries 50 percent weightage. Internal evaluation consists of practical activities i.e. practical works and projects works (35%); marks from trimester examinations (10%), and classroom participation (5%). 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 the teachers. Mark distribution for internal evaluation (practical work and project work) will be as follows:

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

6	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.
- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 9 **Subjects : Agriculture Extension and Computer Science** **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	4	4	2	1	3	2	1	2	1	0	9	5	2	16	9	25	16	3
2	Communication	4																	3
3	Basic sociological concept	5																	4
4	Extension programplanning, monitoring and evaluation	3																	2
5	Group and rural leadership	5																	2
6	Gender and development	6																	5
7	Introduction to computer	4																	3
8	Competer system	6																	5
9	Operating system	6																	5
10	Multimedia	9																	8
11	Computer networks and topologías	6																	5
12	Internet and its application.	6																	5
	Total	64	4	2	1	3	2	1	2	1	0	9	5	2	16	9	25	16	50

Principle of Agronomy

Grade: 9 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This course explains the role of soil and climatic factors in crop production and the basic principles underlying the successful crop production. This syllabus provides the overview of agriculture and agronomy, weather and climate, tillage, seed and seed quality, cropping system, soil fertility and soil productivity, soil erosion, weed management, irrigation and drainage in relation to filed crop production.

This curriculum comprises the fundamental principles encompassing introduction to agronomy, climate, farm mechanization, cropping system, water management, weed management, hill, rainfed and organic agriculture, manure and fertilizer. It will be delivered using both the conceptual and practical inputs through presentation, discussion, reflective readings 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 works. 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. Explain the climate, tillage and plant nutrients affecting the growth, development and yield of the field crops
2. Identify the crops ready for harvesting and harvest subsequent storage techniques
3. Identity tools and equipment used in tillage and other agricultural operations
4. Apply manure and fertilizer and water in the field for successful crop production
5. Enable to identify the major need for appropriate management practices ofthe

crops and apply them as per the need

6. Demonstrate the knowledge for seed production of field crops
7. Explain the problems and characteristics of hill, rainfed and organic agricultural systems

3. Grade wise Learning Outcomes

S.N.	Content Area	Learning outcomes
1.	Introduction to agronomy	1.1. Define agriculture and agronomy 1.2. Differentiate subsistence agriculture and commercial agriculture 1.3. Discuss the importance of agronomy in Nepalese context 1.4. Classify agronomical crops based on various characteristics
2.	Climate and Ecozones	2.1. Define climate and weather 2.2. Discuss the different types of climates 2.3. Understand the climate of Nepal, climatic zones in relation of agriculture 2.4. Describe the effect of climate on crop production 2.5. Define climate change,global warming and their effect on crop production 2.6. Discuss the changing status of Nepalese agriculture and rural society
3.	Fundamental of soil	3.1. Definitionand properties of soil 3.2. Discuss the essential plant nutrients and their functions
4.	Tillage	4.1. Define tillage, its type and its importance. 4.2. Demonstrate &application of different tillage operations.
5.	Manure and fertilizer	5.1. Understand elements, nutrients and plant nutrition in relation to crop production 5.2. Define manures and fertilizers and with their nutrient contents: inorganic fertilizers and organic manures. 5.3. Understand the process of green manuring crops with its importance and other biofertilizers.

6.	Cropping System	6.1. Define cropping system and cropping pattern 6.2. Define cropping scheme and crop rotation and plan crop rotation in your locality 6.3. Understandcropping systems farming systems and in different ecological zones of Nepaland in your locality
7.	Water and Weed management	7.1. Irrigation 7.1.1. Discuss the importance of water in crop life. 7.1.2. Understand the water supplement to crop and define irrigation 7.1.3. Explain the different types of irrigation system practiced in Nepal 7.1.4. Draw a table for critical stages of moisture requirement in major agronomical crops 7.2. Drainage 7.2.1. Define drainage and drainage system 7.2.2. State the objective and importance of drainage in crop production 7.2.3. Discuss the adverse effect of poor drainage in crop production 7.2.4. Explain rain water harvesting and its technique 7.3.Weed 7.3.1. Define the weed and write down the losses by weeds and benefits from them 7.3.2. Discuss the management technique of weeds
8.	FarmMechanization	8.1. Define farm mechanization and understand the tractor 8.2. Understand various types of the ploughs and their function 8.3. Understand the working mechanism of seed drill and seed cum fertilizer drill and rice planter machines 8.4. Discuss the possibilities of farm mechanization in your locality and in Nepal 8.5. Understand the harvester and its works

4.Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1.	Introduction to agronomy	1.1.Definition of agriculture, agronomy subsistence agriculture, commercial agriculture. 1.2. Importance of agronomy and its role in Nepalese context 1.3. Agronomical classification of field crops	6
2.	Climate and ecozones	2.1. Definition of climate, weather and agro-meteorology 2.2. Types of climatic season. 2.3. Classification of different climatic zones 2.4. Effect of climatic factor on crop production 2.5. Introduction to climate change and global warming	9
3.	Fundamental of soil	3.1. Definition of soil 3.2. Properties of soil 3.3 Essential elements of plant and their major function & deficiency symptom.	8
4.	Tillage	4.1. Define tillage 4.2. Purpose and importance of tillage 4.3. Types of tillage	5
5.	Manure and fertilizer	5.1. Point out importance and nutrient contents of organic manures 5.2. Define green manuring crops with its importance and nutrient contents 5.3. Explain the different types of green manuring crops used in crop production 5.4. Define chemical fertilizers with its importance and nutrient contents	10
6 .	Cropping system	6.1. Definition of cropping system& cropping pattern 6.2. Mono cropping 6.3. Mixed & relay cropping 6.4. Inter& multiple cropping 6.5. Cropping scheme & crop rotation 6.6. Cropping intensity, cropping index	5

7.	Water and weed management	7.1. Irrigation 7.1.1. Importance of water in crop life 7.1.1. Introduction to irrigation 7.1.3. Different irrigation systems in crops production 7.1.4. Critical stages of moisture requirement of major agronomical crops	
		7.2. Drainage 7.2.1. Concept, objective and importance of drainage and drainage system in crop production 7.2.2. Water logging in crop production 7.2.3. Rain water harvesting and its technique 7.3. Weed management 7.3.1. Definition of weed 7.3.2. Losses and benefits of weeds 7.3.3. Managements of weeds: prevention and control 7.3.4. Physical, cultural, biological and chemical methods of weed control with their relative advantages and disadvantages	12
8.	Farm mechanization	8.1. Conceptand usage of farm mechanization 8.2. Tractor and farm machines with their advantages and disadvantages. 8.3. Seed drill, seed cum fertilizer drill machine 8.4. Tools and machine use in tillage operations 8.5. Harvester	9
Total			**64**

5. Suggested Practical and Project Works

The practical work that students do during their course is aimed at providing learning opportunities to accomplish competency of the curriculum as well as reinforcing their

learning of the subject.Similarly, involving in a project work fosters the self-learning of students in both the theoretical and practical contents. As this subject emphasizes on enriching the students with both theoretical and practical knowledge and skills, some practical and project works are suggested for them. However, the tasks presented here are the samples only. A teacher can assign the extra practical and project works as per the students' need or specific context.

Unit	**Grade 9**		
	Scope	**Practical Activities**	**Hrs.**
1.	Introduction to agronomy	1.Identify plants and seeds of common agronomic crop	3
		2. Get exposure to government and private farms to impart the knowledge of modern farmingtechniques.	5
		3.Conduct sampling for seed testing and test of seed for germination	3
		4. Identification of healthy and diseased seeds	3
		5. Identifycommon insects and diseases of the major crops	3
2.	Climate	6.List the different agronomical crops cultivated in different climatic zones	2
4.	Tillage	7.Identification various tools and equipment	2
		8. Practice of different tillage operations	3
5.	Manure and fertilizer	9.Be familiar with manure and fertilizers.	5
		10.Prepare the composts.	6
		11.Calculate the amount of manure and fertilizer for different crops	3
		12.Apply manure and fertilizer in the field as per the time and methods in available crop.	6
6.	Cropping system	13. Get exposure to intercropping plots(practice of maize+soyabean)	3

7..	Water& weed management	14.Exercise the practice of surface irrigation	4
		15. Get familiar with the practices of erosion control methods	4
		16. Identify the important weeds of agronomic crops	3
		17. Practice the application of weedicides	2
8.	Seed and seed production	18.Visit to seed production site	1
		19.Practice seed sampling for testof seed	1
		20.Conduct seed testing (Germination, vigor processing,grading, cleaning,etc.)	2
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 the methods and techniques that are more students-centered and appropriate to facilitate the learning. Thefollowingfacilitation methods, techniquesand strategieswillbeapplied while conductingthe teaching learningprocess:

- Lecture
- Demonstration
- Presentation
- Audio/visual class
- Case study
- Practical works
- Project works
- Field study
- Discussion
- Group works and pair works
- Questionnaire

- Observation method
- Assignment and presentation

8. 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 of the 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 which consistsof practical activities i.e. practical works and projects works (35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5
6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and skills and competencies of student in using apparatus.
- 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 examiner.

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. Question paper in examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 9 Subjects : Principle of Agronomy 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 agronomy	6	7	2	1	2	2	0	0	1	1	9	5	2	16	9	25	16	5
2	Climate and ecozones	9																	7
3	Fundamental of soil	8																	6
4	Tillage	5																	4
5	Manure and fertilizer	10																	7
6	Cropping System	5																	4
7	Water and Weed management	12																	10
8	Farm Mechanization	9																	7
	Total	**64**	7	2	1	2	2	0	0	1	1	9	5	2	16	9	25	16	50

Basic Horticulture

Grade: 9 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This course provides the basic knowledge and skills on general horticulture in Nepalese prospective. This course comprises status of horticultural development in Nepal, factors affecting horticultural crop production and measure to manage them, general introduction to various types of horticultural enterprises, orchard establishment and management, basic of plant propagation and its methods, growth and development of horticultural plants.

This curriculum comprises thefundamental and conceptual principles and practices of horticulture, an introduction toclimate, home garden, organic farming, orchard management, plant growthand development, Plant growth Regulators, Harvesting and post-harvest handling of fruits and preservation of fruits. It will be delivered using both the practical 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 systematically.

2.Competencies

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

- Acquire general knowledge about horticulture and classify horticultural crops
- Understand climatic factors and their impact on horticultural crops.
- Design home garden
- Understand concept of organic farming
- Plan, organize and establish a new orchard

- Perform intercultural operation
- Demonstrate the use of PGRs on horticultural crops
- Determine proper stage of flowering
- Perform post- harvest management.

4. Grade wise Learning Outcomes

S. N.	Content Area	Learning outcomes
1.	Introduction	1.1. Define horticulture and explain its branches 1.2.Explain the importance & scope of horticulture 1.3. List out tropical, sub-tropical and temperate fruit crops found in Nepal 1.4. Classify horticulture plants 1.4.1. Classify fruits 1.4.2. Classify vegetables 1.4.3. Classify flowers
2.	Climate	2.1. Elaborate the climate and whether 2.2. Discuss the various environmental factors affecting fruit production
3.	Home garden	3.1. Define home garden 3.2. Show difference between home garden & kitchen garden 3.3. Discuss the selection criteria of fruit crop for home garden
4.	Organic farming	4.1. Define organic farming 4.2. State the principle of organic farming 4.3. Explain themerits and demerits of organic farming
5.	Orchard management	5.1. Define orchard 5.2. List the factors to be considered while establishing an orchard 5.3. Design orchard layout 5.4. Differentiate training and pruning 5.5. Discuss the different methods of training and pruning

		5.6. Understand gather the concept of soil management practice to maintain soil fertility 5.7. Discuss the importance of liming in orchard 5.8. Discuss the irrigation and drainage methods in orchard 5.9. Explain mulching techniques in orchard 5.10. List out point to be considered in soil fertility management in the locality 5.11. Define Windbreak, crop rotation, alley cropping, sod culture and contour cropping
6.	Plant growth and development	6.1. Define dormancy and explain its causes 6.2. Describe the methods of breaking dormancy 6.3. Define germination and list out its type 6.4. Discuss about the on flowering and vernalization 6.5.Describe Maturity, juvenility, fruiting, fruit ripening, fruit drop, ripening and senescence 6.6. Recall the various types of senescence
7.	Plant growth Regulators	7.1. Define plant growth regulators 7.2. Explain the types and functions of PGRs 7.3. Point out the importance and commercial use of PGRs in fruit crops
8.	Harvesting and post-harvest handling of fruits	8.1. List out the point to be considered for maturity judgment of fruits 8.2. Explain the harvesting techniques of fruits crops 8.3. Discuss the post-harvest handling techniques of fruits crops 8.4. Point out the precautions to be applied at storage and marketing of food crops

9.	Preservation of fruits	9.1. Describe different principles of preservation of fruits crops 9.2. Explain the canning and bottling technique in fruits 9.3. Make clear the concept of drying and dehydration
10.	Advanced horticulture	10.1. Explain protected cultivation 10.2. Discuss the importance and problems of protected cultivation 10.3. Be familiar with hydroponics and aeroponics

4. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1.	Introduction	1.1. Meaning & definition of horticulture and its branches 1.2. Importance &scope of horticulture 1.3. Classification of horticulture plants 1.3.1 Classification of fruits 1.3.2 Classification of vegetables 1.4.3 Classification of flowers	7
2.	Climate	2.1. Concepts of climate & weather 2.2. Environmental factors affecting horticultural crops production • Temperature • Light • Rainfall and humidity • Wind • Snow • Hailstorm • Soil moisture	5
3.	Home garden and small scale farming	3.1. Definition of home garden, difference between home garden & kitchen garden 3.2. Basis of crops selection for home garden	3

4.	Organic farming	4.1. Concept and definition of organic farming 4.2. Principle of organic framings 4.3. Methods of organic farming 4.4. Advantages and disadvantages of organic farming	4
5.	Orchard management	5.1. Introduction to orchard 5.2. Training and pruning of fruits crops 5.3. Methods of training and pruning 5.5.Soil management practice to maintain soil fertility in orchard 5.6. Mulching techniques 5.7. Soil fertility management 5.8. Windbreak 5.9. Alley cropping 5.10. Sod culture 5.11. Contour cropping	12
6.	Plant growth and development	6.1. Dormancy 6.1.1. Causes of dormancy 6.1.2. Methods of breaking dormancy 6.2. Germination and its type 6.3. Flowering 6.3.1 Photoperiodism 6.3.4 Vernalization 6.5. Maturity 6.6. Juvenility 6.7. Fruiting 6.7.1. Fruit setting 6.7.2. Fruit drop 6.7.3. Fruit ripening 6.7.4. Fruit senescence and its type	12
7.	Plant growth Regulators	7.1. Meaning and definition of plant growth regulators 7.2. Types and functions of PGRs	6

		7.3. Importance and commercial use of PGRs in fruit crops	
8.	Harvesting and post-harvest handling of fruits	8.1. Maturity judgment of fruits 8.2. Harvesting and harvesting techniques 8.3. Post-harvest handling techniques 8.4. Storage 8.5. Marketing	8
9.	Preservation of fruits	9.1. Principles of preservation 9.2. Canning and bottling 9.3. Drying and dehydration	4
10.	Advanced horticulture	10.1. Protected cultivation, its importance and problems 10.2. Hydroponics 10.3. Aeroponics	3
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 the 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 the specific context.

Unit	**Grade 9**		
	Scope	**Practical Activities**	**Hrs.**
1	Introduction	1. Identification of Fruits & plantation crops	2
3	Home garden	2. Preparation of seed bed/nursery bed for home garden.	2
4	Organic farming	3. Visit to nearest organic farm	2
5	Orchard management	4. Application of Fertilize/manure of fruit trees	3
		5. Prepare Bordeaux mixture/paste	5
		6. Lay-out orchard	5
		7. Perform Training and pruning of fruit and plantation	5

		crop	
		8. Practice cutting/layering/grafting	10
6	Plant growthand development	9. Perform method of breaking seed dormancy	3
7	Plant growthRegulators	10. Study the ripening of banana	5
8	Harvesting and post-harvest handling of fruits	11. Identification of harvesting and post-harvest handling tools/equipment of fruit crops	2
9	Preservation of fruits	12. Study the equipment/tools used for preservation	4
		13. Perform dehydration and water loss in different fruits	6
		14. Prepare jam/jelly/ketchup/juice/squash/pickles	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 student-centered and appropriate to facilitate the learning.The followingfacilitation methods, techniquesand strategieswillbeapplied while conductingthe teaching learningprocess:

- Presentation
- Demonstration
- Case study
- Exhibition method
- Practical works
- Project works
- Problem solving

- Assignment and presentation
- Field study
- Discussion
- Group works and individual works
- Questionnaire
- Exploration

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 of the 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 i.e. practical works and projects works(35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5

6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.
- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 9 Subjects : Basic Horticulture 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	7																	5
2	Climate	5																	4
3	Home garden and small scale farming	3																	2
4	Organic farming	4																	3
5	Orchard management	12																	10
6	Plant growth and development	12																	10
7	Plant growth Regulators	6	7	3	1	2	1	0	0	1	1	9	5	2	16	9	25	16	5
8	Harvesting and post-harvest handling of fruits	8																	6
9	Preservation of fruits	4																	3
10	Advanced horticulture	3																	2
	Total	64	7	3	1	2	1	0	0	1	1	9	5	2	16	9	25	16	50

Plant Protection

Grade: 9 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This course provides the brief introduction ofthe insects, diseases, and weedsas the enemies of plant which significantly reduce the crop yield.Similarly, the course also describes about the details of pesticides like pesticide classification, mode of actions, pesticide formulations, toxicity level of pesticide, safe use of pesticide, pesticide poisoning symptoms and first aid practices, methods of pesticide application, pesticide spraying techniques, etc.

This curriculum comprises concept and fundamental principles and practices, an introduction, insects, diseases, weeds, pesticides, plantprotectionappliances, plant pest management overall and crop wise, and mushroom cultivation. It will be delivered using both the practical 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 the National Curriculum Framework, 2076. It focuses both on theoretical and practical aspects having equal teaching and practice weightage. 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 conception different terms used in plant protection
2. Identify the insects and their classification.
3. Identify the diseases and their classification.
4. Identify weeds and their effect on crop production.
5. Identify pesticides, their types and application method

6. Be familiar with the plant protection appliances
7. Distinguish between IPM and Non-IPM techniques.
8. Identify mushroomsand their types.

3.Grade wise Learning Outcomes

S. N.	Content Area	Learning outcomes
1.	Introduction	1.1. Define the term: pest, insect, disease, pathogen, micro-organism, rodent, nematode, disorder, pesticide, weed, entomology and pathology
2..	Insects	2.1. Write down the characteristic features of insect 2.2. Illustrate the life cycle of different insect 2.3. Define metamorphosis 2.4. Classify insects on the basis of different aspects: like feeding habit, nature of damage etc. 2.5. List out the natural enemies of insect-pests
3.	Diseases	3.1. Define diseases and write their symptoms. 3.2. Classify Infectious and noninfectious diseases. 3.3. Understand about disease cycle. 3.4. Understand fungi, bacteria, nematode, virus etc. 3.5. Write down the factors responsible for disease development. 3.6. Explain plant disease epidemiology.
4.	Weeds	4.1. Define weed 4.2. Discuss the different types of weeds 4.3. Discuss the effect of weed on crop production
5.	Pesticides	5.1. Define pesticide 5.2. Give the examples of insecticide, fungicide, nematicide, antibiotic, rodenticide, herbicide etc. 5.3. Explain the formulation of pesticide 5.4. Calculate the pesticide for application on infected fields. 5.5. Write down the method of pesticides application 5.6. Explain the toxicity of pesticide after use 5.7. State the harmful effect of pesticide: poisoning and

		pollution 5.8. Discuss the safe use and misuse of pesticide 5.9. Explain pesticide poisoning symptoms and state first-aid measure 5.10. Pesticide rules and regulation in Nepal
6.	Plant protection appliances	6.1.Be familiar with plant protection appliances 6.2. Write down the plant protection appliances commonly used in Nepal 6.3. Discuss on the proper handling, care and maintenance of sprayers and duster
7.	Plant pest management	7.1. Explain the principles of plant pest management: 7.2. Discuss physical mechanical, cultural, biological, chemical, regulatory and genetic method of pest management. 7.3. Explain Integrated pest management (IPM)
8.	Crop management	8.1. Understand the concepts of ICM (IntegratedCrop Management) 8.2. Acquire the concepts, importance and principle of IntegratedPest Management (IPM) 8.3. Be familiar with the concepts, importance and principle Integrated Weed Management (IWM)
9	Mushroom Cultivation	9.1. Discuss importance and scope of mushroom cultivation 9.2. List out poisonous and non-poisonous mushroom 9.3. Identify the different types of mushroom available in Nepal. 9.4. Discuss about the cultivation practices of mushroom (oyster, button, shitake)

4.Scope and Sequence of Contents

Unit	**Scope**	**Content**	**Hrs.**
1.	Introduction	1.1. Concept and definition of • Biotic and abiotic factor in plant protection • Pest • Insect	6

		• Disease • Pathogen • Micro-organism • Rodent • Nematode • Disorder • Pesticide • Weed • Entomology • Pathology	
2.	Insects	2.1. Definition and characteristic features of insect 2.2. Insect life cycle and metamorphosis 2.3. Classification of insects on the basis of different aspects: Like feeding habit, nature of damage etc. 2.4. Natural enemies of insect	**9**
3.	Diseases	3.1. Meaning of disease and its symptoms 3.2. Disease cycle 3.3. Introduction to plant pathogen: Fungi, Bacteria, Nematode, Virus etc. 3.4. Disease triangle	6
4.	Weeds	4.1. Definition of weed/types of weeds 4.2. Effect of weeds on crop production: competition for water nutrient, sunlight, air etc.	5
5.	Pesticides	5.1. Definition of pesticide 5.2. Types of pesticides (insecticide, fungicide, nematicide, antibiotic, rodenticide, etc.) 5.3. Forms of pesticide 5.4.Calculation of commercially formulated pesticide 5.5. Methods of pesticide application • Soil application • Foliar application • Fumigation • Seed treatment	10

		• Post-harvest treatment 5.6. Harmful effect of pesticide: Poisoning and pollution 5.8. Safe use and misuse of pesticide 5.9. Pesticide poisoning symptoms and first-aid measure 5.10. List of banned pesticides in Nepal	
6.	Plant protection appliances	6.1. Introduction to plant protection appliances 6.2. Plant protection appliances commonly used in Nepal • Sprayers • Dusters 6.3. Proper handling, care and maintenance of above equipment	5
7.	Plant pest management	Explanation of the principles of plant pest management: 7.1 Physical method 7.2 Mechanical method 7.3 Cultural method 7.4 Biological method 7.5 Chemical method 7.6 Regulatory method 7.7 Genetic method	5
8.	Crop management	7.1 Definitions and concepts of ICM (Integrated crop management) 7.1.1 concepts, importance and principle of Integrated pest management (IPM) 7.1.2 Concepts, importance and principle Integrated weed management (IWM)	8
9.	Mushroom cultivation	8.1 Importance and scope of mushroom cultivation 8.2 Enumeration of poisonous and non-poisonous mushroom 8.3Types of Mushroom and its cultivation (oyster, button & shitake)	10
Total			**64**

5. Suggested Practical Activities

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 of this subject are mentioned below. As these are the basic and fundamental practical and project works, the teacher can adapt or introduce more relevant to their context and students' needs.

Unit	Grade 9		
	Scope	**Practical Activities**	**Hrs.**
1.	Introduction	1. Study the General study of common insects and diseases	3
2.	Insects	2. General features of common insects	3
		3. Life cycle of Arthropoda and insects	3
		4. Identify natural enemies of insects	3
		5. Identify common harmful and beneficial insects	3
3.	Diseases	6. Identify disease symptoms	3
4.	Weeds	7. Collect the samples ofmajor weeds of major crops and prepare the herbarium	3
5.	Pesticides	8. Identify different pesticides found in Nepal	3
		9. Calculate amount of pesticide required	4
		10. Formulate and dilute pesticides	3
		11. Prepareof Bordeaux mixture	3
6.	Plantprotection appliances	12. Identify different plant protection appliances.	3
7..	Plant pest management	13. Collect and preserve different insects	4
		14. Collect and preserve insect-damaged plant part	2
		15. Collect and preserve diseased-plant and plant part	4
		16. Practice different method of pesticide application	3
		17. Practice of IPM in the field	3
		18. Apply indigenous method of pest management	2

8.	Mushroom cultivation	19. Visit to nearest thecommercial mushroom farm	3
		20. Identify poisonous and non-poisonous mushroom	3
		21. Cultivate oyster/button/shitakemushrooms.	3
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 processes while teaching. In particular, the teacher can make use of the following methods and strategies for the learning facilitation:

- Classroom instruction
- Discussion
- Demonstration and observation
- Problem solving
- Presentation method
- Project works
- Case study
- Practical works
- Field visit
- Visual method
- Group works and individual works

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 of the 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 i.e. practical works and projects works (35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5
6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.
- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 9 **Subjects : Plant Protection** **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	6																	5
2	Insects	9																	7
3	Diseases	6																	5
4	Weeds	5																	4
5	Pesticides	10																	8
6	Plant protection appliances	5																	4
7	Plant pest management	5																	3
8	Crop management	8													16		25	16	6
9	Mushroom cultivation	10	6	2	0	2	2	1	1	1	1	9	5	2		9			8
	Total	64	6	2	0	2	2	1	1	1	1	9	5	2	16	9	25	16	50

Industrial Entomology and Fish Culture

Grade: 10 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This course provides the clear concepts of beneficial insects such as honey bees, silkworms, lace insects and biological agents and crop pollinators. Similarly this curriculum also explains the characteristics of cultivable and cultivated fish species and their management practices.

This curriculum comprises of conceptual and fundamental principles and practices, beekeeping, sericulture, fish pond, fish culture system and fish preservationand marketing. It will be delivered using both the practicaland 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 the 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 systematically.

2.Competencies

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

1. Identify bee species for keeping purpose
2. Explain life cycle of honey bee
3. Describe insect pests and diseases of honey bees and their control measures.
4. Cultivate suitable variety of mulberry for silkworm
5. Explain life cycle of silkworm
6. Rearing and harvesting of cocoon
7. Understand fish culture and fish farming

8. Rear fish with modern system
9. Identify fish diseases and control methods
10. Protect fish from predators

3. Grade wise Learning Outcomes

Section A (Industrial Entomology and Fish Culture)		
S. N.	**Content Area**	**Learning outcomes**
1.	Beekeeping	1.1. Define apiculture and state its terminologies. 1.2. Explain the importance and scope of apiculture 1.3. List out different species of bee. 1.4. Illustrate the life cycle of bee 1.5. Point out the colony selection criteria for queen rearing. 1.6. Prepare the hive for baiting 1.7. Explain about colonization and stocking 1.8. Explain about swarming and its management technique 1.9. Describe about comb management 1.10.Acquire knowledge on sign symptoms, prevention and treatment related to different diseases of honeybee. 1.11. Write the technique to handle bee hive. 1.12. Manage the foraging of bee
2.	Sericulture	2.1. Introduce sericulture 2.2. Discuss the importance and scope of sericulture in Nepal. 2.3. Establishnew mulberry garden 2.4. Discuss about site selection and plantation of mulberry plant 2.5. Rear silk worm & produce silk fiber 2.6. Practice to produce mulberry plants from cuttings 2.7. Observe the cocoon quality 2.8. Explain the characteristics of cocoon
Section B (Fish Culture)		
3.	Introduction	3.1. Discuss the importance and scope of fish culture in Nepal 3.2. Identify indigenous and exotic fish species
4.	Fish pond	4.1. Construct fish pond

		4.2. Explain about the management of fish pond 4.3. Describe the control measure of aquatic weeds 4.4.List out important fish predators and identify their control measures
5.	Fish culture system	5.1. Describe the characteristics and cultivation practices of Tilapia, Pangasius, Common Carp and Mangur) 5.2. Describe poly culture of fish with its importance 5.3. Explain common fish disease with its prevention and treatment
6.	Fish preservation and marketing	6.1. Explain the harvesting method of fish 6.2.Explain about using ice for fish transport 6.3. Explain the fish packaging method 6.4. Describe fish transportation method

4.Scope and Sequence of Contents

Section A (Industrial Entomology and Fish Culture)			
Unit	**Scope**	**Content**	**Hrs.**
1.	Beekeeping	1.1. Introduction 1.2. Importance and scope 1.3. Varieties/types of bees 1.4. Life cycle 1.5. Bee colony and management 1.6.Selection of hive and baiting 1.7. Colonization and stocking 1.8. Swarming 1.9. Combs and their management 1.10.Pest, predators and disease 1.11. Hives, their types and selection 1.12. Foraging of bees	20

2.	Sericulture	2.1. Introduction 2.2.Importance and scope 2.3. Mulberry cultivation 2.4. Silkworm rearing 2.5. Young age silkworm rearing 2.6.Late age silkworm rearing 2.7. Introduction of cocoon, cocoon quality, characteristics and classification 2.8. Silk production	12

Section B (Fish Culture)			
Unit	**Scope**	**Content**	**Hrs.**
3.	Introduction	3.1. Definition, importance and scope of fish culture in Nepal 3.2. Indigenous and exotic fish species, their identification	8
4.	Fish pond	4.1. Fish-pond construction 4.2. Management of fish pond 4.3. Aquatic weeds and the control method 4.4. Fish predators and control methods	10
5.	Fish culture system	5.1. Mono culture (Tilapia, Pangasius, Common carp and Mangur) 5.2. Poly culture of fish and its importance 5.3. Common fish disease, prevention and treatment	7
6.	Fish preservation and marketing	6.1. Harvesting method 6.2. Use of ice for fish transport 6.3. Fish packaging method 6.4. Fish transportation method	7
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 10		
	Scope	**Practical Activities**	**Hrs.**
	Section A (Industrial Entomology)		
1	Beekeeping	1. Identify of different varieties of bees	**2**
		2. Join and separate the colony	**3**
		3. Practice on queen production and management	**3**
		4. Prepare hive and practice its handling	**3**
		5. Familiar with the use of different protective wear and equipment	**2**
		6. Practice on honey and wax extraction	**3**
		7. Identify different diseases and pests	**4**
2	Sericulture	8. Identify the silkworm	**3**
		9. Perform mulberry cultivation	**3**
		10. Identify different types of cocoon	**2**
		11. Visit and get acquainted with silk rearing industry	**6**
Section B (Fish Culture)			
3	Introduction	12. Identify external and internal organs of fish	**2**
		13. Differentiate between the male and female fish	**3**
		14. Differentiate between healthy and diseased fish	**3**

4	Fish pond	15. Practice layout and design of fish pond	**2**
		16. Identify different equipment and their uses in fish culture, breeding	**2**
		17. Identify planktons and weeds consumed by grass carp	**3**
5	Fish culture system	18. Perform methods of fish seed stocking, growthcheckup, feed, fertilizer and lime application	**3**
		19. Perform water quality test	**2**
		20. Prepare snake trap to control snake	**3**
		21. Prepare of drag net	**2**
6	Fish preservation and marketing	22. Harvest fish using different methods	**3**
		23. Pack fish in ice for transportation to market	**2**
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 processes while teaching.

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

- Demonstrationand observation
- Questionnaire
- Exhibitionmethod
- Practical Works
- Audio/Visual aids

- Assignments and presentation
- Project Works
- Problem solving
- Exploration
- Group discussion
- Groupworks and individual works

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 of the 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 i.e. practical works and projects works (35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3

3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5
6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.
- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 10 Subjects : Industrial Entomology and fish culture 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	Beekeeping	20	6	2	1	3	2	0	0	1	1	9	5	2	16	9	25	16	16
2	Sericulture	12																	10
3	Introduction	8																	6
4	Fish pond	10																	8
5	Fish culture system	7																	5
6	Fish preservation and marketing	7																	5
	Total	64	6	2	1	3	2	0	0	1	1	9	5	2	16	9	25	16	50

Food Crop Production

Grade: 10 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This curriculum provides the theoretical as well as practical knowledge of improved agronomical practices of cereal, oilseed, grain legume and industrial crop production. This course also consists of basic knowledge and skill related to production of major foods and their role in ensuring food security.

This curriculum comprises of conceptual and fundamental principles and Practices, an Introduction, Cultivation of cereal crops, Cultivation of oilseed crops, summer and winter grain legume production. It will be delivered using both the practical 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 the National Curriculum Framework, 2076. It focuses on both the theoretical and practical aspects having equal teaching and practical weightage. It incorporates the level-wise competencies, grade-wise leaning outcomes, scope and sequence of contents, suggested practical/project activities, learning facilitation processes 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. Explain the principles of crop husbandry in relation to successful production of major field crops
2. Cultivate the major and minor crops like rice, maize, wheat, oil seeds, pulses and industrial crops.
3. Describe the relationship between crop productivity and cultural practices
4. Identify common insects, pest/diseases of agronomical crops
5. Be familiar with agronomical practices for production of cereals, oil seeds, grain legumes, cash and industrial crops

3. Grade wise Learning Outcomes

S.N.	Content Area	Learning outcomes
1.	Introduction	1.1. Differentiate between subsistence and commercial agriculture 1.2.Classify cereals, oilseeds, grain legumes, cash and industrial crops 1.3. Discuss the importance and scope of agronomical crops in Nepal 1.4. Explain the geographical distribution of agronomical crops in Nepal
2.	Cultivation of cereal crops	2.1. Cultivate the major and minor cereal crops like rice, maize, wheat, millet, buckwheat, and barley 2.2. Be familiar with agronomical practices for the production of cereal crops
3.	Cultivation of oilseed crops	3.1. Cultivate oilseed crops like rapeseed, mustard, sunflower, linseed 3.2. Identify common insects, pest/diseases of oilseed crops 3.3. Be familiar with modern agronomical practices for the production of oilseed crops
4.	Summer and winter grain legume production	4.1. Cultivate legume crops like lentil, chickpea, cowpea, pigeon pea 4.2. Identify common insects, pest/diseases of legumes crops 4.3. Be familiar with modern agronomical practices for production of the legume crops

4.Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1.	Introduction	1.1. Definition of food security and sustainable agriculture 1.2. Concept of food security and its importance 1.3. Geographical distribution of agronomical crops in Nepal	8
2.	Cultivation of cereal crops	Study of the following crops with respect to origin, distribution, area, production, climate, soil, variety, land preparation, manure, field preparation, time and method of sowing, irrigation, weeding, insect pest, disease, harvesting, yield, storage and economics of production: trade/marketing 2.1. Rice 2.2. Wheat 2.3 Maize 2.4. Millet 2.5. Buckwheat 2.6. Barley	24
3.	Cultivation of oilseed crops	Study of the following crops with respect to origin, distribution, area, production, climate, soil, variety, land preparation, manure, field preparation, time and method of sowing, irrigation, weeding, insect pest, disease, harvesting, yield, storage and economics of production: trade/marketing 3.1. Rapeseed 3.2. Mustard 3.3. Sunflower 3.4. Linseed 3.5. Ground nut	16

4.	Summer and winter grain legume production	Study of the following crops with respect to origin, distribution, area, production, trade, climate, soil, variety, land preparation, manure, seed treatment, field preparation, time and method of sowing, irrigation, weeding, insect pest, disease, harvesting, yield, storage and economics of production: trade/marketing 4.1.Lentil 4.2.Chickpea 4.3.Cowpea 4.4. Pigeon pea 4.5. Soyabean	16
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 adopt them or use similar other project works as per their students need and specific context.

Unit	**Grade 10**		
	Scope	**Practical Activities**	**Hrs.**
1.	Introduction	1. Identify seed and plants of agronomical crops and prepare herbarium file	**8**
2.	Cultivation of cereal crops	2. Calculate the doses of fertilizers and apply as basal and top dressing	**9**
		3. Collect/identify weeds of common crops	**4**
		4. Cultivation of major cereal crops	**12**
3.	Cultivation of oilseed crops	5. Collect/identify common insect pests and diseases of oilseedcrops	**6**

		6. Identify/collect weed insect pest and disease of oilseed crops	**6**
4.	Summer and winter grain legume production	7. Calculate and understand thespraying technique of pesticides/herbicide/fungicideto control pests and diseases	**12**
5.	Miscellaneous	8. Collect various agronomical seeds	**7**
Total			**64**

6. Learning Facilitation 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 student centered and appropriate to facilitate the content. The following facilitation methods, techniques and strategies will be applied while conducting the teaching learning process:

- Classroom instruction
- Demonstration and observation
- Illustration of diagrams and visual aids
- Presentation
- Case study
- Practical works
- Project works
- Field visit and report writing
- Group works and pair works
- Exploration

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 of the 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 i.e. practical works and projects works (35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5
6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.

- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 10 Subjects : Food Crop Production 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	8	6	2	1	2	2	0	1	1	1	9	5	2	16	9	25	16	6
2	Cultivation of cereal crops	24																	20
3	Cultivation of oilseed crops	16																	12
4	Summer and winter grain legume production	16																	12
	Total	64	6	2	1	2	2	0	1	1	1	9	5	2	16	9	25	16	50

Horticultural Crop Production

Grade: 10 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This curriculum helps to manage the cultivation of potential fruits and plantation crops for commercial production in Nepal. This course also provides knowledge and skills on the principles and practices of vegetable and spice crop production in Nepal.

This curriculum comprises conceptual and fundamental principles and practices of horticultural crops: an introduction, cultivation of tropical fruit crops, cultivation of sub-tropical fruit crops, cultivation of temperate fruit crops, cultivation of cole crops, cultivation of root crops, cultivation of leafy vegetable crops, cultivation of tuber crops, cultivation practices of leguminous crops, cultivation practices of solanaceous crops, cultural practices of bulb crops, cultivation practices of cucurbitaceous vegetable crops, cultivation practices of spices crops and plantation crops. It will be delivered using both the practical 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 systematically.

2.Competencies

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

1. Acquire general knowledge about horticulture
2. Cultivate the tropical fruits crops
3. Cultivate the sub-tropical fruits crops
4. Cultivate the temperate fruits crops

5. Cultivate the vegetables crops
6. Cultivate the spice crops
7. Cultivate the plantation crops
8. Identify common insect's pests/ disease of horticultural crops
9. Identify method of harvesting, processing and storage of horticultural crops

3.Grade wise Learning Outcomes

S. N.	Content Area	Learning outcomes
1.	Introduction	1.1. Define horticulture 1.2. Describe the importance and scope of horticultural crop production in Nepal 1.3.List out the constraints to horticultural crop production and suggest possible remedies
2.	Cultivation of tropical fruit crops	2.1. Cultivate the tropical crops like mango, papaya, litchi, pineapple, banana 2.2. Identify common insects, pest/diseases of tropical crops 2.3. Identify the stage of maturity and method of harvesting of tropical fruits crops.
3.	Cultivation of sub-tropical fruit crops	3.1. Cultivate the sub-tropical crops like mandarin, sweet orange, lime, lemon, pomegranate & kiwi 3.2. Identify common insects, pest/diseases ofsub-tropical crops 3.3.Identify the stage of maturity and method of harvesting of sub-tropical fruits crops.
4.	Cultivation of temperate fruit crops	4.1. Be familiar with cultivation practices of temperate crops. 4.2. Cultivate the temperate crops like apple, pear, peach, grape 4.3. Identify common insects, pest/diseases oftemperate crops. 4.4 Identify the stage of maturity and method of harvesting of temperate fruits crops.
5.	Cultivation of cole crops	5.1. Cultivate the colecrops like cauliflower, broccoli, cabbage 5.2. Identify common insects, pest/diseases ofcolecrops 5.3. Identify the stage of maturity and method of harvesting of

		cole crops.
6.	Cultivation practices of root crops	6.1. Cultivate the root crops like radish and carrot 6.2. Identify common insects, pest/diseases of root crop 6.3. Identify the stage of maturity and method of harvesting of root crops.
7.	Cultivation practices of leafy vegetable	7.1. Cultivate the leafy vegetable crops like broadleaf mustard, spinach 7.2. Identify common insects, pest/diseases ofleafy vegetable crops 7.3. Identify the method of harvesting of leafy vegetable crops
8.	Cultivation practice of tuber crops	8.1. Cultivate the tubercrops like potato and yam 8.2. Identify common insects, pest/diseases oftubercrops 8.3. Identify the method of harvesting of tubercrops
9.	Cultivation practices of leguminous crops	9.1. Cultivate the leguminous crops like peas, bean and cowpea 9.2. Identify common insects, pest/diseases ofleguminouscrops 9.3. Identify the method of harvesting of leguminouscrops
10.	Cultivation practices of solanaceous crops	10.1. Cultivate the solanaceous crops like chilly, capsicum, tomato, brinjal &okra 10.2. Identify common insects, pest/diseases ofsolanaceouscrops 10.3. Identify the method of harvesting of solanaceouscrops
11.	Cultural practices of bulb crops	11.1. Cultivate the bulb crops like peas, onion, garlic 11.2. Identify common insects, pest/diseases ofbulbcrops 11.3. Identify the method of harvesting of bulb crops
12.	Cultivation practices of cucurbitaceous vegetables	12.1. Cultivate the cucurbitaceous crops like bitter gourd, bottle gourd, cucumber, watermelon, pointed gourd, pumpkin and squash 12.2. Identify common insects, pest/diseases ofcucurbitaceouscrops 12.3. Identify the method of harvesting of cucurbitaceous

		crops
13.	Cultivation practices of spices	13.1. Cultivate the spices crops like ginger, coriander, cumin, cardamom, turmeric 13.2. Identify common insects, pest/diseases ofspicescrops 13.3. Identify the method of harvesting of spices crops
14.	Cultivation of plantation crops	14.1. Cultivate the plantationcrops like tea, coffee 14.2. Identify common insects, pest/diseases ofplantationcrops 14.3. Identify the method of harvesting of plantation crops

4.Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1.	Introduction	1.1 Specific horticulture crops growing area in Nepal 1.2 Potential of horticultural crop production in Nepal 1.3 Constraints in commercial horticultural crop production and possible remedies	4
2.	Cultivation of tropical fruit crops	Introduction, uses, origin and distribution, varieties, soil and climate, propagation methods, cultivation practices (system of planting, preparation of pits, irrigation, manuring and fertilization, training and pruning, intercultural operation), harvesting, common insect pest and disease of 2.1 Mango 2.2 Papaya 2.3 Litchi 2.4 Pineapple 2.5 Banana	15
3.	Cultivation of sub-tropical fruit crops	Introduction, uses, origin and distribution, varieties, soil and climate, propagation methods, cultivation practices (system of planting, preparation of pits, irrigation, manuring and fertilization, training and pruning, intercultural operation),harvesting, common insect pest	5

		and disease of 3.1 Mandarin orange 3.2 Sweet orange 3.3 Lime	
4.	Cultivation of temperate fruit crops	Introduction, uses, origin and distribution, varieties, soil and climate, propagation methods, cultivation practices (system of planting, preparation of pits, irrigation, manuring and fertilization, training and pruning, intercultural operation), harvesting,common insect pest and disease of 4.1 Apple 4.2 Pear 4.3 Grapes	7
5.	Cultivation of cole crops	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common insect pest and disease of 5.1Cauliflower 5.2Brocauli 5.3Cabbage	5
6.	Cultivation practices of root crops	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common insect pest and disease of 6.1 Radish 6.2 Carrot	3
7.	Cultivation practices of leafy vegetable	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common	4

		insect pest and disease of 7.1 Broad leaf mustard 7.2 Spinach	
8.	Cultivation practices of solanaceous crops	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common insect pest and disease of 9.1 Chili/Capsicum 9.2 Tomato 9.3. Potato	8
9.	Cultural practices of bulb crops	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common insect pest and disease of 11.1 Onion 11.2 Garlic	3
10.	Cultivation practices of cucurbitaceous vegetables	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common insect pest and disease of 12.1 Bitter gourd 12.2 Bottle gourd 12.3 Cucumber	5
11.	Cultivation practices of spices	Introduction, origin and distribution, varieties, soil and climate, nursery bed preparation, cultivation practices (sowing/transplanting, manuring and fertilization, irrigation, intercultural operation), harvesting, common insect pest and disease of 13.1 Ginger	5

		13.2 Coriander 13.3 Cumin 13.4 Cardamom 13.5 Turmeric	
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 of this subject are mentioned below. As these are the basic and fundamental practical and project works, the teacher can adapt or introduce more relevant to their context and students' needs.

Unit	**Grade 10**		
	Scope	**Practical Activities**	**Hrs.**
1.	Introduction	1.Understand the nomenclature of fruits and vegetable crops	3
		2. Identify the tools used in horticulture	2
		3. Identify of major vegetable and be familiar with the varietal characteristics	3
2.	Cultivation of tropicalfruit crops	4. Practice on the training and pruning of fruit trees	5
		5. Perform manuring and fertilization of fruit crops	3
3.	Cultivation of sub-tropical fruit crops	6. Manage the nutrition of tropical fruit crops	2
		7. Identify the nutritional deficiencies in fruit crops	3
4.	Cultivation of temperate fruit crops	8. Study the bearing habits of fruits crops	3
5.	Cultivation of cole crops	9. Prepare the nursery beds and field for cole crops	5

6.	Cultivation practices of root crops	10. Perform intercultural operation (thinning,gap filling, weeding, mulching, earthing up staking) of vegetable	5
		11. Be familiar with the manuring and fertilization system in rootcrops	5
7.	Cultivation practices of leafy vegetable	12. Identify and manage the weeds in leafy vegetable crops	5
8.	Cultivation practices of solanaceous crops	13. Practice on the cultivation of solanaceous crops	10
9.	Cultural practices of bulb crops	14. Practice on the cultivation of bulb crops	5
10.	Cultivation practices of cucurbitaceous vegetables	15. Judge the harvest maturity in cucurbitaceous vegetable crops	5
Total			**64**

6. Learning Facilitation Method and Process

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

- Classroom instruction
- Demonstration and observation
- Illustration of diagrams and visual aids
- Presentation
- Case study
- Practical works

- Project works
- Field visit and report writing
- Group works and pair works
- Exploration

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 of the 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 i.e. practical works and projects works (35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5

6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.
- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 10

Subjects : Horticultural Crop Production

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	4	7	3	1	2	2	0	0	0	1	9	5	2	16	9	25	16	3
2	Cultivation of tropical fruit crops	12																	9
3	Cultivation of sub-tropical fruit crops	5																	4
4	Cultivation of temperate fruit crops	6																	5
5	Cultivation of cole crops	6																	5
6	Cultivation practices of root crops	4																	3
7	Cultivation practices of leafy vegetable	4																	3
8	Cultivation practice of tuber crops	3																	2

9	Cultivation practices of solanaceous crops	5																	4
10	Cultural practices of bulb crops	4																	3
11	Cultivation practices of cucurbitaceous vegetables	6																	5
12	Cultivation practices of spices	5																	4
	Total	64	7	3	1	2	2	0	0	0	1	9	5	2	16	9	25	16	50

Floriculture and Nursery Management

Grade: 10 **Credit Hrs.: 4** **Working Hrs.: 128**

1. Introduction

This course is designed to develop necessary skills and knowledge of horticultural techniques required for general nursery management, pant propagation, flower production and landscaping. This course provides various principles and practices in the field of plant propagation, nursery technique and basic principles and practices for the flower cultivation and land beautification for indoor and outdoor gardening.

This curriculum comprises fundamental conceptual and fundamental principles and practices of flower production: an introduction, garden, ornamental plants, introduction to nursery, nursery containers, nursery structures, and propagation from seeds, vegetative propagation. It will be delivered using both the practical 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 the National Curriculum Framework, 2076. It focuses on both the theoretical and practical aspects having equal theory and practice. 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. Classify ornamental plants and discuss their importance and scope.
2. Design landscape and maintain lawn
3. Describe the cultivation practices of major ornamental plants.
4. Establish nursery for ornamental plants.
5. Develop concepts on nursery container and media mixture.

6. Understand different types of nursery container.
7. Identify the different nursery structure.
8. Practice on different types of propagation.

3.Grade wise learning Outcomes

S.N.	**Content Area**	**Learning outcomes**
1..	Introduction	1.1. Define floriculture 1.2. Describe the importance, scope and challenges of floriculture in Nepal 1.3. Classify of ornamental plants
2.	Garden	2.1. Define garden 2.2. State the scope and importance of garden 2.3. Explain garden types 2.4. Design landscape and maintain lawn 2.5. Describe the principle of landscape design
3.	Ornamental plants	3.1. Perform the cultivation of gladiolus, rose, carnation, gerbera, tuberose, marigold, chrysanthemum and orchid 3.2.Select plant for indoor gardening 3.3. Practice potting and repotting technique of flower 3.4. Prepare bonsai 3.5. Explain the post-harvest management of flowers and vase life
4.	Introduction to nursery	4.1. Define nursery with its type. 4.2. Discuss the scope and importance of nursery in Nepal
5.	Nnursery media	5.1. Point out the characteristics of media 5.2. Discuss theproperties and use of media(soil, sand, compost, vermiculite, sphagnum moss) 5.3. Prepare mixture for container growing and treat media
6.	Nursery containers	6.1. Discuss on nursery containers (clay pots, plastic pots, polyethylene bags)
7.	Nursery	7.1. Prepare hotbed for seedling raising

	structures	7.2. Prepare Plastic tunnel 7.3.Acquire the knowledge on greenhouse
8.	Propagation from seeds	8.1. Illustrate seed viability test 8.2. Explain seed dormancy with its causes and method to breaking seed dormancy 8.3. Prepare seedbed and treat seedbed before sowing 8.4 Mention point to be considered for seedling care
9.	Vegetative propagation	9.1. Point out reasons for using vegetative propagation 9.2. Practice propagation of seedless plant 9.3. Explain the various methods of propagation 9.4. List out the advantages and disadvantages of cutting 9.5. Practice hardwood and semi-hardwood cutting 9.6. Define layering with advantages and disadvantages 9.7. Explain the different techniques of layering 9.8. Perform air layering 9.9. Practice grafting and budding 9.10. Explain different techniques of grafting and budding

5. Scope and Sequence of Contents

Unit	Scope	Content	Hrs.
1.	Introduction	1.1. Meaning, importance and scope and challenges of floriculture in Nepal 1.2. Current status of floriculture in Nepal 1.3. Classification of ornamental plants 1.4. Definition of nursery 1.5. Importance and scope nurseries	**4**
2.	Garden	2.1. Meaning, scope and importance 2.2. Garden types 2.3. Concept of landscape gardening 2.4. Principle of landscape design	**4**

		2.5. Preparation and maintenance of lawn	
3.	Ornamental plants	3.1. Cultivation with respect to uses, variety, soil and climatic requirement, planting, maturing, training and pruning, disease and insect pest control, harvest and post-harvest of: a. Gladiolus b. Rose c. Carnation d. Gerbera e. Tuberose f. Marigold g. Chrysanthemum h. Orchid 3.2 Indoor gardening • Selection and maintenance • Pot culture and hanging basket • Bonsai, its criteria and classification/types • Post-harvest management of flowers and vase life	**20**
4.	Introduction to nursery	4.1. Definition of nursery with its types 4.2. Discussion on the scope and importance of nursery in Nepal.	**1**
5.	Nursery media	5.3. Characteristics of media 5.4. Properties and use of 5.4.1. Soil 5.4.2. Sand 5.4.3. Compost 5.4.4. Vermiculite 5.4.5. Sphagnum moss 5.5. Mixture for container growing 5.6. Treatment of media and mixes	**3**
6.	Nursery containers	6.1. Clay pots 6.2. Plastic pots 6.3. Polyethylene bags	3

		6.4. Jute bags 6.5. Cemented bags	
7.	Nursery structures	7.1. Hotbed and cold frame 7.2. Poly tunnel 7.3.Greenhouse and glass house	5
8.	Propagation from seeds	8.1 Advantages and disadvantages 8.2. Collection of seeds 8.3. Seeds: Viability and germination 8.4. Seed dormancy and its causes 8.5. Breaking seed dormancy 8.6. Preparation of seedbed 8.7. Seed bed treatment and sowing 8.8. Care and maintenance of seedling 8.9. Packaging and marketing	9
9.	Vegetative propagation	9.1. Reasons for using vegetative propagation 9.1.1. Propagation of seedless plant 9.1.2. Avoidance of long juvenile phase 9.2. Methods of propagation 9.2.1. Cutting 9.2.1.1. Advantages and disadvantages of cutting 9.2.1.2. Different techniques of cutting 9.2.2. Layering 9.2.2.1. Advantages and disadvantages of layering 9.2.2.2. Different techniques of layering 9.2.3. Grafting and budding 9.2.3.1. Advantages and disadvantages of grafting and budding 9.2.3.2. Different techniques of grafting and budding	15

Total	64

5. Suggested Practical and Project Works

The practical work that students do during their course is aimed at providing them learning opportunities to accomplish competency of the curriculum as well as reinforcing their learning of the theoretical subject content. Similarly, involving in a project work 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 10		
	Scope	**Practical Activities**	**Hrs.**
1.	Introduction	1.Identify ornamental plants: seasonal and perennials	3
		2. Be familiar with commonly used tools for gardening and lawn making	3
2.	Garden	3. Prepare lawn	3
		4. Prepare landscape designs for residential / public building / park	7
		5. Maintain garden sanitation for ensuring disease and pests management	3
3.	Ornamental plants	6. Potting and repotting of ornamental plants	3
		7. Perform training / pruning of ornament plants	3
		8. Select flowers and perform flower arrangements	3
		9. Identify ornamental plants: seasonal and perennials	3
4.	Nursery media	10. Prepare nursery / annual beds	3
		11. Sow seeds / transplant seedlings	4
		12. Perform packaging / handling / marketing of nursery plants	3

5.	Nursery containers	13. Prepare media / soil mixture for container grown plants	3
6.	Nursery containers	14. Prepare potting mixture	3
		15. Prepare plastic tunnels / hotbed	3
7.	Nursery structures	16. Treat seed for breaking dormancy	3
8.	Propagation from seeds	17. Collect seeds for propagation	2
9.	Vegetative propagation	18. Prepare cuttings of ornamental plants	3
		19. Prepare soil /air layering	3
		20. Prepare grafting/budding	3
Total			**64**

6. Learning Facilitation Process

Learning facilitation process is determined according to the content to be dealt with in the subject. It is 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:

- Classroom instruction
- Demonstration and observation
- Illustration of diagrams and visual aids
- Practical works
- Presentation
- Case study
- Project works
- Field visit and report writing
- Group works and individual works
- Exhibition method

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 i.e. practical works and projects works (35%), marks from trimester examinations (10%), and classroom participation (5%). 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	Marks
1.	Participation	Participation in attendance, homework, classwork, project work, practical works etc.	5
2.	Practical work	Conduction of practical work activities	15
		Record keeping of practical work activities	3
3.	Project work	Conduction of project work activities	10
		Record keeping of project work activities	2
4.	Viva	Viva of practical work and project work activities	5
6.	Internal exam	5 marks in first and second semester each	10
Total			**50**

Note:

- Practical examination will be conducted in the presence of internal and external examiners. Evaluation of experiment will focus both on the product of work and the skills competencies of student in using apparatus.

- Project work assessment is the internal assessment of reports and presentation of their works either individually or on 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 examiner.

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. Question paper for examination will be developed using various levels of revised Bloom's Taxonomy including remembering level, understanding level, application level and higher ability (analyzing, evaluating and creating).

Specification Grid

Grade: 10 Subjects : Floriculture and Nursery Management 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	4	7	4	1	2	1	0	0	0	1	9	5	2	16	9	25	16	3
2	Garden	4																	3
3	Ornamental plants	20																	16
4	Nursery Media	4																	3
5	Nursery containers	3																	2
6	Nursery structures	5																	3
7	Propagation from seeds	9																	7
8	Vegetative propagation	15																	13
	Total	64	7	4	1	2	1	0	0	0	1	9	5	2	16	9	25	16	50