Plant Science

Agriculture Extension and Computer Science

Government of Nepal
Ministry of Education, Science and Technology
Curriculum Development Centre
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Grade 9

Technical and Vocational Stream
Learning Resource Material

Agriculture Extension and Computer Sciences

(Grade 9)

Plant Science

Government of Nepal
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Preface

The curriculum and curricular materials have been developed and revised on a regular basis with the aim of making education objective-oriented, practical, relevant and job oriented. It is necessary to instill the feelings of nationalism, national integrity and democratic spirit in students and equip them with morality, discipline, self-reliance, creativity and thoughtfulness. It is essential to develop linguistic and mathematical skills, knowledge of science, information and communication technology, environment, health and population and life skills in students. It is also necessary to bring the feeling of preserving and promoting arts and aesthetics, humanistic norms, values and ideals. It has become the need of the present time to make them aware of respect for ethnicity, gender, disabilities, languages, religions, cultures, regional diversity, human rights and social values to make them capable of playing the role of responsible citizens with applied technical and vocational knowledge and skills. This learning resource material for Plant Science has been developed in line with the Secondary Level Plant Science Curriculum with an aim to facilitate the students in their study and learning on the subject by incorporating the recommendations and feedback obtained from various schools, workshops, seminars and interaction programs attended by teachers, students and parents.

In bringing out the learning resource material in this form, the contribution of the Director General of CDC Mr. Yubaraj Paudel and members of the subject committee Pro.Dr. Kaniya Prasad Singh, Pro.Dr. Gyan Kumar Shrestha, Dr. Kishorchandra Dahal, Anita Bolakhe is highly acknowledged. The learning resource material is written by Rikhiram Neupane, Santosh Koirala, Niraj Belbase, Purnima Paudel, Mahesh Poudel, Dayamond Pokharel the subject matter of the materials, was edited by Mr. Badrinath Timsina and Mr. Khilanath Dhamala and language was edited by Mr. Binod Raj Bhatta. CDC extends sincere thanks to all those who have contributed to developing this material in this form.

This learning resource material contains a wide coverage of subject matters and sample exercises which will help the learners to achieve the competencies and learning outcomes set in the curriculum. Each chapter in the material clearly and concisely deals with the subject matters required for the accomplishment of the learning outcomes. The Curriculum Development Centre always welcomes constructive feedback for the betterment of the material.

2082 BS

Curriculum Development Centre
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Table of Content

Guidelines to Teachers

A. Facilitation Methods

The goal of this course is to combine the theoretical and practical aspects of the contents needed for the subject. The nature of contents included in this course demands the use of practical or learner focused facilitation processes. Therefore, the practical side of the facilitation process has been focused much. The instructor is expected to design and conduct a variety of practical methods, strategies or techniques which encourage students engage in the process of reflection, sharing, collaboration, exploration and innovation new ideas or learning. For this, the following teaching methods, strategies or techniques are suggested to adopt as per the course content nature and context.

Brainstorming

Brainstorming is a technique of teaching which is creative thinking process. In this technique, students freely speak or share their ideas on a given topic. The instructor does not judge students' ideas as being right or wrong, but rather encourages them to think and speak creatively and innovatively. In brainstorming time, the instructor expects students to generate their tentative and rough ideas on a given topic which are not judgmental. It is, therefore, brainstorming is free-wheeling, non-judgmental and unstructured in nature. Students or participants are encouraged to freely express their ideas throughout the brainstorming time. Whiteboard and other visual aids can be used to help organize the ideas as they are developed. Following the brainstorming session, concepts are examined and ranked in order of importance, opening the door for more development and execution. Brainstorming is an effective technique for problem-solving, invention, and decision-making because it taps into the group's combined knowledge and creative ideas.

Demonstration

Demonstration is a practical method of teaching in which the instructor shows or demonstrates the actions, materials, or processes. While demonstrating

something the students in the class see, observe, discuss and share ideas on a given topic. Most importantly, abstract and complicated concepts can be presented into visible form through demonstration. Visualization bridges the gap between abstract ideas and concrete manifestations by utilizing the innate human ability to think visually. This enables students to make better decisions, develop their creative potential, and obtain deeper insights across a variety of subject areas.

Peer Discussion

Peer conversation is a cooperative process where students converse with their peers to exchange viewpoints, share ideas, and jointly investigate subjects that are relevant or of mutual interest. Peer discussion is an effective teaching strategy used in the classroom to encourage critical thinking, active learning, and knowledge development. Peer discussions encourage students to express their ideas clearly, listen to opposing points of view, and participate in debate or dialogue, all of which contribute to a deeper comprehension and memory of the course material. Peer discussions also help participants develop critical communication and teamwork skills by teaching them how to effectively articulate their views, persuasively defend their positions, and constructively respond to criticism.

Peer conversation is essential for professional growth and community building outside of the classroom because it allows practitioners to share best practices, work together, and solve problems as a group. In addition to expanding their knowledge horizon and deepening their understanding, peer discussions help students build lasting relationships and a feeling of community within their peer networks.

Group Work

Group work is a technique of teaching where more than two students or participants work together to complete a task, solve a problem or discuss on a given topic collaboratively. Group work is also a cooperative working process where students join and share their perspectives, abilities, and knowledge to

take on challenging job or project. Group work in academic contexts promotes active learning, peer teaching, and the development of collaboration and communication skills. Group work helps individuals to do more together than they might individually do or achieve.

Gallery Walk

Gallery walk is a critical thinking strategy. It creates interactive learning environment in the classroom. It offers participants or students a structured way to observe exhibition or presentation and also provides opportunity to share ideas. It promotes peer-to-peer or group-to-group engagement by encouraging participants to observe, evaluate and comment on each other's work or ideas. Students who engage in this process improve their communication and critical thinking abilities in addition to their comprehension of the subject matter, which leads to a deeper and more sophisticated investigation of the subjects at hand.

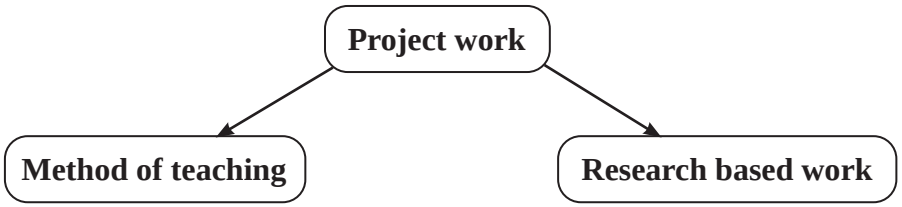
Interaction

The dynamic sharing of ideas, knowledge, and experiences between people or things is referred to as interaction, and it frequently takes place in social, academic, or professional settings. It includes a broad range of activities such as dialogue, collaboration or team work, negotiation, problem solving, etc. Mutual understanding, knowledge sharing, and interpersonal relationships are all facilitated by effective interaction. Interaction is essential for building relationships, encouraging learning, and stimulating creativity in both in-person and virtual contexts. Students can broaden their viewpoints, hone their abilities, and jointly achieve solutions to difficult problems by actively interacting with others.

Project Work

Project work is a special kind of work that consists of a problematic situation which requires systematic investigation to explore innovative ideas and solutions. Project work can be used in two senses. First, it is a method of teaching in regular class. The next is: it is a research work that requires planned investigation to

explore something new. This concept can be presented in the following figure.



Project work entails individuals or teams working together to achieve particular educational objectives. It consists of a number of organized tasks, activities, and deliverables. The end product is important for project work. Generally, project work will be carried out in three stages. They are:

- Planning
- Investigation
- Reporting

B. Instructional Materials

Instructional materials are the tools and resources that teachers use to help students. These resources/materials engage students, strengthen learning, and improve conceptual comprehension while supporting the educational goals of a course or program. Different learning styles and preferences can be accommodated by the variety of instructional resources available. Here are a few examples of typical educational resource types:

- Daily used materials
- Related Pictures
- Reference books
- **Slides and presentation:** PowerPoint slides, keynote presentations, or other visual aids that help convey information in a visually appealing and organized manner.
- **Audiovisual materials:** Videos, animations, podcasts, and other multimedia resources that bring concepts to life and cater to auditory and visual learners.

- **Online Resources:** Websites, online articles, e-books, and other web-based materials that can be accessed for further reading and research.

Maps, charts, and graphs: Visual representations that help learners understand relationships, patterns, and trends in different subjects.

Real-life examples and Case Studies: Stories, examples, or case studies that illustrate the practical application of theoretical concepts and principles.

C. Assessment

Formative Test

Classroom discussions: Engage students in discussions to assess their understanding of concepts.

Quizzes and polls: Use short quizzes or polls to check comprehension during or after a lesson.

Homework exercises: Assign tasks that provide ongoing feedback on individual progress.

Peer review: Have students review and provide feedback on each other's work.
Summative Test

Exams: Conduct comprehensive exams at the end of a unit or semester.

Final Projects: Assign projects that demonstrate overall understanding of the subject.

Peer Assessment

Group projects: Evaluate individual contributions within a group project.

Peer feedback forms: Provide structured forms for students to assess their peers.

Classroom Presentations: Have students assess each other's presentations.

Objective Test

Multiple-choice tests: Use multiple-choice questions to assess knowledge.

True/False questions: Assess factual understanding with true/false questions.

Matching exercises: Evaluate associations between concepts or terms.

Portfolio Assessment

Compilation of work: Collect and assess a variety of student work samples.

Reflection statements: Ask students to write reflective statements about their work.

Showcase events: Organize events where students present their portfolios to peers or instructors.

Observational Assessment

Classroom observations: Observe students' behavior and engagement during class.

Performance observations: Assess practical skills through direct observation.

Field Trips: Evaluate students' ability to apply knowledge in real-world settings.

Section A (Agriculture Extension)

INTRODUCTION

Unit 1

1.1 Education

Education is the process of learning new things, gaining knowledge, and developing skills. It helps people understand the world around them and prepares them for life. For example, in school, students learn subjects like math and science to solve problems and understand nature. Another example is when someone learns how to cook from their family, which is also a kind of education. Education can happen in many places, such as classrooms, homes, or even outside in the community. It is important because it helps us grow and become better individuals. Without education, it is hard to succeed in life.

Education is the process of bringing desirable changes in human behavior. Education can also be defined as the process and activities of acquiring knowledge, skills, attitudes, and habits through instruction, study or experiences during life process. Education is meant for the change in behavioral components of human beings in the desirable direction. In general, there are four kinds of desirable changes in human behavior.

- **Change in Knowledge**

  Extension education act as vehicle for disseminating new ideas or knowledge to the people. This process and activities ultimately adds knowledge to the people or brings change in what they know. For example; to select the quality seed for better yield. Extension education provides knowledge on different aspect of quality seed such as physical appearance of the seed, germination percentage of the seed, and purity percentage of the seed, etc.

- **Change in Skill**

  Skill refers to the art of performing anything. Extension education not only provides theoretical ideas about the problems, but it also provides how to solve the problem. For example; after it gives knowledge about the quality seed, it provides how to identify, select, and buy quality seed for the cultivation process of any crop.

- **Change in Attitude**

  Attitude means thought or reflection or manner or mindset of an individual. Extension education changes the mind set of farmers after they get knowledge about the specific problem. For example; The better yield result from the use of quality seed creates positive attitudes towards selection and use of quality seed.

- **Change in Action**

  After someone attains positive attitude towards the any new idea or echnique, he/she will be ready to adopt the particular idea or technique. In this way, extension education can change the action of a person. For example; When the farmer's attitude towards the use of quality seed becomes positive, he/she will certainly be ready to perform activities to select or buy quality seed before the cultivation of crop.

1.1.1 Types of Education

The main theme of education is to develop individual or society or nation as a whole with the desirable changes through educational programs, activities or process. On the basis of structure and system of the educational program, education can be classified into several types, which are explained below.

1. **Formal Education**

   Formal education is the type of learning that happens in schools and colleges. It is also known as structured form of learning, where we get degrees and certificates after we complete our education of certain level. In this type of education, students are usually taught in classrooms, and the

education process is regulated by educational authorities.

2. Informal Education

Informal education is the learning that happens in our daily life, without a plan or any schedule. It refers to learning that occurs outside of formal institutions like schools or universities. It can take place in family settings, communities, workplaces, or even through media such as books, TV etc. For example, children learning to speak their mother tongue at home or learning to cook by watching their parents, gaining knowledge about farming by helping elders in the field, or learning to fix a problem in bike by observing the work of a mechanic, etc.

3. Non- formal Education

Non-formal education is the type of learning that happens outside the regular school or college system. It is a type of organized learning that takes place outside the formal school system but still planned and structured. Non formal education does not typically lead to formal qualification like diplomas or degrees but it helps individuals gain practical knowledge and skills. For example, attending classes of computer skills, joining adult literacy classes, taking part in workshops or seminars, etc.

Differences between Formal Education, Non formal Education and Informal Education

Formal Education	Non-Formal Education	Informal Education
Structured and systematic learning within recognized institutions (schools, colleges, universities).	Organized learning outside traditional schools but planned and structured.	Unstructured, spontaneous, and occurs naturally in daily life.
Follows a fixed curriculum.	Does not follow a standard curriculum but is designed based on learners' needs.	No curriculum; learning is incidental and casual.

Leads to diplomas, certificates, or degrees.	Does not lead to formal qualifications but offers practical skills or knowledge.	Does not provide certifications but enriches knowledge and experience.
Requires formal admission and registration.	No formal admission or registration process.	No admission or registration is required.
Teachers and educational authorities control the learning process.	Learners or facilitators have greater control over the process.	Learning is self-directed or guided by informal influences (family, peers, media, etc.).
Formal examinations are conducted.	No formal examinations; assessments are often practical and need-based.	No examinations or assessments.
More theoretical and academic.	More practical, focused on real-life problems and skill development.	Practical, experience-based learning.
Involves fees and institutional rules.	Usually free or low-cost with no strict rules.	Free and unrestricted.
Curriculum-oriented and rigid in approach.	Flexible and problem-oriented, tailored to specific groups or issues.	Highly adaptable and varies with context.
Takes place in classrooms or structured learning environments.	Takes place in communities, training centers, or workplaces.	Occurs in everyday environments like homes, workplaces, or public spaces.

Importance of Education in Our Context

Education is very important for the people of Nepal because it helps them learn skills and knowledge needed for a better life. It helps people get good jobs and improve their family's life. It also helps understand their rights and responsibilities in the community. In a country like Nepal, where there are many challenges like poverty and lack of resources, education gives hope for a better future. Also, in the rural areas of Nepal, there exist too many socio-economic challenges . Education plays a vital role in empowering individuals

and transforming communities, serving as a foundation for a brighter and more sustainable future. The importance of education in the context of Nepal are:

1. **Personal Development**

   Education helps people grow by increasing their knowledge and skills. It builds confidence and teaches how to think clearly and solve problems. When individuals learn, they become better prepared to face different problems and challenges in life and improve themselves. For example, education helps youth in Nepal gain self-reliance and personal strength.

2. **Economic Growth**

   Education plays an important role in improving the economy. Skilled and educated people can get good jobs and start businesses, which create income and help families escape poverty. A well-educated workforce is necessary for Nepal to develop industries and contribute to national progress.

3. **Improved Agricultural Practices**

   Education teaches farmers new ways to grow crops and rear animals. Learning about modern tools and techniques helps increase food production and reduce losses. This improves farmers' income and supports food security in Nepal's rural areas. Education spreads knowledge about using resources wisely and protecting farmland.

4. **Health Awareness**

   Education creates awareness about hygiene, nutrition, and healthcare, reducing mortality rates and improving overall community health. It helps people understand how to live healthy lives by knowing about nutrition, hygiene, and disease prevention. When people learn about all these things, they can take care of themselves and their families better.

5. **Social Equity**

   Education promotes fairness by giving all children, including girls and marginalized groups, the chance to learn. It helps difference caused by caste, gender, and poverty. Educated people are more likely to respect

diversity and work for justice in society.

6. National Development

Education is the foundation for builiding a strong and prosperous country. It develops skills of citizens, who can contribute to government, business, and society. Educated citizens are more likely to contribute positively to governance, infrastructure development, and national progress.

7. Problem-Solving Skills

Through education, people learn how to think critically and find answers to difficult questions. This skill is important for individuals and communities to overcome challenges. In Nepal, problem solving helps in areas like natural disaster management, health crises, and economic difficulties. Educated people can analyze situations and make better decisions.

8. Community Development

Education encourages participation in community activities, fosters leadership, and helps individuals work collectively for the betterment of their society. It empowers people to work together to improve their neighborhoods and villages. It encourages participation in activities like school builiding, cleaning localitites, health campaigns, and sanitation programs.

9. Environmental Awareness

Education teaches the importance of protecting nature and using natural resources more wisely. People can learn about conserving forests, water, wildlife, which is very important in Nepal's rich but fragile environment. When people acquire knowledge about pollution, its effects in environment, and climate change, motivates people to act responsibly. Educated citizens are more likely to support sustainable development.

10. Cultural Preservation

Education helps in promoting and preserving cultural heritage, language, and traditions while also embracing modernization. It helps pass down

traditions, languages, knowledge, and customs to younger generations. In Nepal, where many ethnic groups reside, education can protect cultural diversity while promoting respect between communities.

1.2 Definition, Objective and Importance of Extension Education

1.2.1 Extension Education

Extension education means teaching people outside the classroom to help them solve real-life problems and improve their skills. It is about sharing useful knowledge, like better farming methods, to make life better for individuals and communities.

The word ***"extension"***is derived from Latin word, ***"Ex"*** meaning out and "tensio" meaning stretching. So extension means to extend, to spread or to disseminate.

Extension Education is a science that brings about desirable changes in the behavior of the persons through educational methods to improve their general standard of living with their own efforts**.**

Extension is used to disseminate useful information and ideas to the ordinary people in their working situation.

1.2.2 Objective of Extension Education

1. **Increase Farmers' Income**: Extension education aims to teach farmers better farming techniques and methods to sell their produce effectively, helping them earn more money.
2. **Improve Living Standards**: It focuses on improving the quality of life for rural people by introducing them to modern facilities and practices.
3. **Promote Social Activities**: Extension education organizes programs in villages to bring people together for fun, learning, and community development.
4. **Develop Leaders**: It trains individuals in villages to become strong and capable leaders who can guide their communities.
5. **Encourage Independence**: It helps rural people become self-reliant by teaching them skills to solve their problems and make their own decisions.
6. **Provide Education and Health**: Extension education works to bring schools and health services to rural areas, ensuring people have access to basic education and healthcare.
7. **Encourage Participation**: It motivates villagers to actively take part in community programs and activities for their betterment.
8. **Train Youth**: Extension education teaches valuable skills to young people in villages, preparing them for better opportunities in the future.
9. **Share Information**: It spreads helpful knowledge and information to rural areas, ensuring people stay informed about new advancements and opportunities.
10. **Solve Problems**: Extension education listens to farmers' problems and works on finding practical solutions to improve their lives.

These objectives help in the overall development of rural communities, making them stronger and more self-sufficient.

Importance of Extension Education

1. **Share Useful Information**

   Extension education helps farmers learn new and practical ideas developed through research. It provides farmers with important and updated information about crops, livestock, and farming techniques. It helps farmers learn about new varieties of seeds, pest control, and weather changes. By sharing this knowledge, farmers can make better decisions and improve their farming practices in Nepal.

2. **Use New Farming Methods**

   Extension education provides farmers with important and updated information about crops, livestock, and farming techniques. It helps farmers learn about new varieties of seeds, pest control, and weather changes. By sharing this knowledge, farmers can make better decisions and improve their farming practices in Nepal.

3. **Explain Research**

   Extension educators explain scientific research results in simple language to farmers. They show how research can be used practically on farms to solve problems and increase production. This linkage helps farmers apply innovations developed by research centers and universities in Nepal.

4. **Solve Farmers' Problems**

   Extension education helps farmers identify their problems by themselves and make better decisions to solve their problems in best way possible. Extension workers visit farms and provid e advice to farmers and take feedbacks from farmers. They also work as agent to transfer existing problems of farmers to researchers.

5. **Improve Productivity**

   Through training and guidance, extension education helps farmers use resources more effectively and adopt best practices. This leads to higher crop and livestock productivity, which improves food security and farmers'

incomes. Improved productivity contributes to Nepal's overall agricultural development.

6. **Promote Sustainable Farming**

   Extension education teaches farmers how to protect soil, water, and the environment while practicing farming.It encourage practices like crop rotation, mixed cropping, organic farming, efficient water management, integrated pest management techniques, and integrated plant nutrient management techniques, etc. These methods help ensure farms can produce food for a long time without harming the land or water.

7. **Enhance Living Standards**

   By providing knowledge and skills, extension education helps farmers increase their crop and livestock production. More production means more income, which improves the quality of life for farming families. Better living standards come with improved food availability, health, education, and housing. It helps rural communities move out of poverty and live better lives.

8. **Encourage Teamwork**

   Extension education motivates rural communities to work together to solve common problems and achieve collective goals. It promotes group activities like farmers' groups and Farmers' Field Schools (FFS) where farmers learn together. Working in groups help share knowledge, solve problems collectively, and support each other.

9. **Support Rural Youth**

   Extension education offers training and information that help young people gain skills for modern farming and entrepreneurship. It encourages youth to stay involved in agriculture by making it more attractive and profitable. Supporting rural youth with education and resources helps reduce migration to cities and keeps young energy in village development.

Role of Extension in Agriculture Development

1. **Sharing Knowledge**

   Extension workers educate farmers about improved ways to grow crops and raise animals, ensuring they stay updated with new advancements.

2. **Introducing Modern Tools**

   Extension workers teach farmers how to use advanced tools, machines, and technology, making farming more efficient and less labor-intensive.

3. **Improving Productivity**

   By promoting better farming methods, extension services help farmers increase their crop yields and income.

4. **Solving Problems**

   Extension workers listen to the challenges faced by farmers and assist them in finding practical and effective solutions.

5. **Bridging the Gap**

   They serve as a link between researchers and farmers, helping bring scientific innovations and knowledge directly to the fields.

6. **Encouraging Sustainable Farming**

   Extension services teach farmers eco-friendly methods that conserve soil, water, and the environment while improving agricultural output.

7. **Building Skills**

   They provide training to farmers and young people, equipping them with the skills and confidence needed to excel in farming.

8. **Creating Awareness**

   Extension workers inform farmers about government schemes, subsidies, and other opportunities that can benefit their agricultural practices.

9. **Developing Communities**

   By encouraging teamwork and cooperation, extension services help rural communities enhance farming practices and improve their overall standard

of living.

1.4 History of Agriculture Extension in Nepal

The Father of Agricultural Extension is generally recognized as Seaman A. Knapp (1833–1911).

Knapp was an American agricultural educator and pioneer in agricultural extension services. He introduced the concept of demonstration farms, where new agricultural methods were showcased directly on farmers' fields to encourage adoption. This approach became the foundation for modern agricultural extension practices worldwide.

Agriculture extension education in Nepal began in the early 1950s, soon after the end of the Rana regime, with the support form India and United States of America. The initial efforts started with the Rural Development Program called Tribhuwan Gram Bikas in 1952, which aimed to provide farmers with new knowledge and improve agricultiral practices. In 1959, the Department of Agriulture (DoA) established a formal Agricultural Extension Section to institutionalize extension services, focusing on sharing farming technologies, training farmers, and improving crop production. Over the decades, Nepal's extension system evolved from a top-down approach to more participatory and community-based models, introducing various methods such as the Tuki system, Training and Visit (T&V) system, and Farmer Field Schools. Today, agricultural extension continues to be a vital link between research, education, and farmers, helping improve productivity and sustainability in Nepal's diverse agricultural landscape.

Some efforts in agricultural extension education were made in the Rana regime as well. Several efforts made in the history of agricultural extension education based on the timeline, since it started in Nepal, is briefly explained below.

Early Efforts in Agriculture

i. Junga Bahadur Rana (1846-1877)

- Introduced one Jersey bull and two cows, and clover grass from the

U.K. (1851).

- Initiated a cattle breeding programme.
- Introduced tea plants from China to the eastern hilly regions of Nepal.

ii. **Chandra Shamsher (1922)**

- Established an agricultural office named "Krishi Adda" at Singha Durbar, Kathmandu.
- "Krishi Adda" was renamed the Department of Agriculture (DoA) in 1925.

iii. **Juddha Shamsher (1932-1945)**

- Established the **Agricultural Council** and a **veterinary hospital** in Kathmandu.
- Sent Nepali students to India for agricultural training.

iv. 1945

- Two experimental farms were established at **Parwanipur** and **Kakani**.

v. 1952

- An organized extension service began with the **Tribhuvan Gram Vikash Program**, a rural development initiative.

vi. 1956-1961

- Nepal launched its **First Five-Year Plan**, focusing on agricultural development.

vii. **1959**

- The **Agricultural Extension Section** was established under the Department of Agriculture (DoA).
- Village Development Workers were converted into **Junior Technical Assistants (JTAs)**.
- Extension offices were opened in 25 districts, expanding to 49 districts by 1961.

Expansion of Agricultural Infrastructure

i. **1961**

- **Zonal Agriculture Development Offices** were established in five zones.

ii. **1962-1965**

- During the **Second Five-Year Plan**, concepts of horticulture, livestock, and food crops were introduced.

iii. **1963**

- Zonal Agriculture Development Offices expanded to 55 districts.

iv. **1966**

- Target set to establish extension offices in all 75 districts.
- District Agriculture Extension Offices were renamed as **District Agriculture Development Offices (DADO)**.

Agricultural Education and Community Involvement

i. **1972**

- The **Institute of Agriculture and Animal Science (IAAS)** was established under Tribhuvan University (TU) in Kathmandu and relocated to **Rampur, Chitwan** in 1974.

ii. **1977**

- The **Tuki System** was launched in Dolakha and Sindhupalchowk.
- Progressive farmers were used as key extension agents under this program.

Modernization and Diversification

i. **1981-1982**

- The Department of Agriculture was divided into two departments:
- Department of Livestock Development.
- Department of Animal Health (DLDAH).

ii. 1985-1990

- The **Seventh Five-Year Plan** was implemented to enhance agricultural productivity.

iii. **1992-1997**

- The **Eighth Five-Year Plan** emphasized sustainable economic growth, poverty alleviation, and reducing regional imbalances.

iv. **1997-2002**

- The government launched the **20-Year Agriculture Prospective Plan (APP)**, a long-term vision for agricultural development.

Key Events After 2000s

i. **2002**

- The National Agricultural Policy was introduced to prioritize sustainable agriculture, poverty alleviation, and increased agricultural productivity.

ii. **2004**

- National Agriculture Biodiversity Policy was legislated to conserve and utilize agricultural biodiversity.

iii. **2006**

- The Agriculture and Food Security Project (AFSP) was initiated to improve food and nutrition security in Nepal, particularly targeting vulnerable regions.

iv. **2010**

- Nepal became a member of the South Asian Association for Regional Cooperation (SAARC) Seed Bank to promote regional cooperation in seed security.

v. **2013**

- The government launched the Agriculture Development Strategy (ADS) to replace the Agriculture Prospective Plan (APP).

- ADS focused on commercialization, sustainability, and improving the livelihood of farmers.

vi. **2017**

- The Constitution of Nepal (2015) decentralized agricultural extension services, giving more authority to local governments under the federal system.
- Provinces and local governments began implementing region-specific agricultural programs.

Exercise

Choose the correct answer from the given alternatives.

1. What is the main goal of education?
   a. To change the size of farms
   b. To bring desirable changes in human behavior
   c. To promote the use of pesticides
   d. To increase the population

2. Which of the following is an example of informal education?
   a. Learning in a classroom
   b. Watching a farming program on TV
   c. Attending a university lecture
   d. Writing an exam in school

3. What is the key feature of non-formal education?
   a. It is rigid and curriculum-oriented
   b. It provides degrees and certificates
   c. It is practical and flexible
   d. It charges fees and fines

4. What does "extension" mean?
   a. To restrict and limit
   b. To grow and develop
   c. To extend, spread, or disseminate
   d. To destroy or eliminate

5. What is one major difference between formal and non-formal education?
   a. Formal education is practical, while non-formal is theoretical.
   b. Formal education is for school-goers, while non-formal is for non-

school-goers.

c. Formal education does not involve exams, while non-formal does.

d. Non-formal education is rigid, while formal is flexible.

6. What is the role of extension workers in agriculture?

a. To provide entertainment to farmers.

b. To connect farmers with research and modern methods.

c. To increase taxes on farming activities.

d. To sell farming tools to villagers.

7. Which of the following is NOT an objective of extension education?

a. Train youth in farming skills.

b. Promote social activities in rural areas.

c. Increase dependence on external help.

d. Solve farmers' problems.

8. What was the first organized rural development program introduced in Nepal?

a. Tuki System b. Tribhuwan Gram Vikash

c. Five-Year Plan d. Agricultural Prospective Plan

9. What significant milestone was achieved in Nepal's agriculture in 1945?

a. Establishment of a veterinary hospital

b. Introduction of Jersey cows

c. Creation of two experimental farms

d. Launch of the Agricultural Prospective Plan

10. Why is sustainable farming important, according to extension education?

a. It saves money by using pesticides.

b. It focuses only on profits.

c. It protects the environment while farming.

d. It avoids using modern tools.

Write short answer to the following questions.

1. What are the three kinds of desirable changes in human behavior that education brings? Provide examples for each.
3. What are the main objectives of extension education? Explain any four.
4. Describe the modern history of agricultural extension in Nepal.
5. Explain the differences between formal education and non-formal education with two examples for each.

Write long answer to the following questions.

1. What is Extension Education? Explain the objectives of extension education in agricultural development.
2. Explain the role of extension education in agriculture development in Nepal.

Project Work

1. Draw a simple flowchart diagram illustrating the process of information flow in agricultural extension project and present it in your classroom. (Use a chart paper)

Unit 2

Communication

2.1 Concept of Communication in Extension Education

Communication is the exchange or transfer of ideas, thoughts, or emotions from one person to another accurately and satisfactorily. In extension education, communication plays a vital role in transferring knowledge and skills to farmers, rural communities, and other target audiences. It helps in bringing about changes in behavior, improving productivity, and solving real-life problems.

Components/Elements of Communication

As communication is a key part of extension education, it helps to share knowledge, ideas, and technologies from extension workers to farmers. For successful communication, the following five basic components are needed.

1. **Sender (Source)**

   The source is the person who starts the communication. In extension education, this is often the extension worker or an expert. The source creates and sends the message to others. The effectiveness of communication depends on how well the source knows the topic and understands the audience. The source should be trustworthy and clear.

2. **Message**

   The message is the information, idea, or knowledge that the source wants to share. In extension education, it could be a new farming method or advice. The message must be simple, clear, and suited to the receiver's needs. It should use words or examples that the receiver can easily understand. The success of communication depends on how well the message is made.

3. Channel (Medium)

The channel is the way or method used to send the message. Common channels in extension education are meetings, leaflets, radio, or group discussions. Choosing the right channel helps people receive the message more effectively. Sometimes, using more than one channel makes communication better. Visual aids and demonstrations are also popular channels in extension.

4. Receiver (Audience)

The receiver is the person or group who gets the message. In extension education, this is usually the farmer or rural community. The receiver must pay attention, understand, and accept the message. Their education level, beliefs, and interest can affect how they respond. Good communication tries to match the message to the receiver's background.

5. Feedback

Feedback is the reaction or response from the receiver back to the source. It helps the source know whether the message was understood correctly. Feedback can be spoken, written, or through actions (like adopting a new practice). It is very important for improving future communication. Feedback makes communication a two-way process.

Teaching-Learning Process in Extension Education

The teaching-learning process in extension education helps farmers learn and adopt new techniques that improve their farming practices. This process is designed to make learning engaging, practical, and applicable in real life. It consists of six key steps that guide the learners from attention to satisfaction.

Steps in Extension Teaching-Learning Process

The teaching-learning process in extension education helps farmers and rural communities understand, adopt, and apply new practices effectively. This process follows six key steps:

Fig: Steps in teaching learning process

1. **Attention**

   The first step is to grab the learners' attention. If learners aren't paying attention, they won't absorb the information. Extension workers use engaging methods like stories, visuals, or demonstrations that appeal to the learners' interests. People tend to remember what they do rather than what they hear. So, interactive activities, visual aids, or real-life examples help learners stay focused and engage with the material. Example: Showing a video of a successful farmer or conducting a live demonstration of a farming technique.

2. **Interest**

   After grabbing attention, the next step is to create a genuine interest in the topic. Extension workers make the topic relevant to the learners' needs, explaining why learning this new idea or technique is beneficial. **Example**: Explaining how a new farming technique can increase crop yields or reduce costs, making it relevant to the farmer's own situation.

3. **Desire**

   This step involves building a strong desire in the learners to know more and adopt the new idea or practice. Extension workers focus on the practical benefits of the new practice to make the learners eager to try it out.

Example: Showing how adopting modern irrigation techniques can save water and increase farm productivity, motivating the learners to implement these methods.

4. **Conviction**

At this stage, the goal is to convince the learners that the new idea or practice is worthwhile and can be effective. Extension workers provide solid evidence, like research results, success stories, or field demonstrations, to show that the new method works. **Example**: Sharing data on how adopting crop rotation helped other farmers boost their yields or reduce pest problems.

5. **Action**

This step encourages the learners to take action and apply the new knowledge or techniques. Extension workers provide hands-on support, demonstrations, or training to ensure learners can easily apply what they've learned. **Example**: Helping farmers set up a new irrigation system or assisting in setting up a composting system, ensuring they understand how to apply the techniques in real-life situations.

6. **Satisfaction**

After taking action, it's important to ensure the learners are satisfied with the results. Satisfaction encourages them to continue using the new practices. Extension workers follow up with learners to see how the new method is working and offer support if needed. When farmers see positive outcomes, they are motivated to continue applying what they learned. **Example**: If a farmer adopts a new farming practice and experiences better crop yields or higher income, they will be encouraged to keep using the method and may even share it with others.

2.2 Method of Communication in Extension Education

In extension education, effective communication is essential to transfer knowledge and practices to the target audience. There are three primary methods of communication used by extension workers: **Individual**

Contact, **Group Contact**, and **Mass Contact**.

1. Individual Contact

Individual contact involves direct interaction between an extension worker and a single person. This method allows for personalized communication, where the extension worker can address specific needs and challenges faced by the individual. Individual contact method is applicable for addressing specific issues, such as pest outbreaks, crop disease, or introducing new technology to individual farmers.

Methods of Individual Contact

- **Home Visits**: Extension workers visit farmers at their homes to provide tailored advice and guidance.
- **Personal Calls**: Direct calls to farmers to discuss specific problems and provide solutions.
- **Office Calls**: Farmers can make calls to the government offices and related stakeholders to get information and inform about the problems.

Advantages

- Private consultation to the needs of the individual.
- Immediate feedback and interaction.
- Builds trust and rapport between the extension worker and the farmer.

Disadvantages

- It is more time-consuming as it involves meeting each individual separately.
- As compared to other methods, it has limited reach.

2. Group Contact

Group contact involves an extension worker interacting with a group of individuals at the same time. This method is efficient in delivering information to a larger audience simultaneously, and it is often used when

addressing common issues faced by a community. Group contact method is effective for traininng large groups, sharing new techniques, or discussing common agricultural issues that affect the community.

Methods of Group Contact

- **Method Demonstrations**: Extension workers demonstrate new farming techniques to a group of farmers (e.g., new crop varieties, irrigation methods, or pest control techniques).
- **Result Demonstrations**: Showing the results of implementing new farming practices to a group.
- **Field Tours**: Farmers visit a demonstration farm or field where they can observe new techniques in action.
- **Meetings, Seminars, and Workshops**: Organized events where information on specific topics, such as government schemes, new agricultural technologies, or sustainable farming, is shared.

Advantages

- Can reach a larger audience in less time.
- Encourages interaction and discussion among participants.
- Effective for introducing new practices or technologies to a community.

Disadvantages

- Less personalized, may not address individual concerns.
- Some participants may feel shy or uncomfortable asking questions in a large group.

3. Mass Contact

Mass contact refers to the dissemination of information to a large audience through mass media or other communication channels. This method is used to spread information quickly and efficiently to a broad audience. Mass method is ideal for spreading general information, government policies, awareness campaigns and promoting upcoming agricultural programs or events.

Methods of Mass Contact

- **Radio and TV Broadcasts**: Information about new farming techniques, weather forecasts, government policies, or agricultural programs can be broadcast to a large audience.
- **Newspapers and Magazines**: Articles, advertisements, or notices published in newspapers or magazines can inform farmers and rural communities about new agricultural developments.
- **Social Media and Websites**: Platforms like Facebook, Twitter,

and YouTube can be used to share videos, articles, and tutorials on agricultural topics.

- **Posters and Flyers**: Printed materials can be distributed in rural areas to inform farmers about upcoming events, government programs, or best practices.

Advantages

- Reaches a large number of people quickly.
- Cost-effective, especially for reaching remote areas.
- Provides repeated exposure to key messages.

Disadvantages

- Less interactive, feedback is not immediate.
- May not be as effective for illiterate populations or those without access to media.

2.3 Role of Extension Workers in the Transfer of Technology

Extension workers are professionals who help farmers and rural communities adopt new agricultural practices, improve productivity, and solve various challenges. Their work is crucial in transferring knowledge, sharing modern techniques, and ensuring the success of agricultural development programs. The role of extension workers in technology transfer includes the following key responsibilities:

1. Collaborating with Farmers and Reporting to Agricultural Officers

- Extension workers work closely with farmers to understand their needs, challenges, and the local agricultural conditions.
- They regularly report to higher authorities providing feedback on the progress and challenges faced by farmers.
- This collaboration helps in designing better support programs and ensuring that farmers receive the necessary assistance.

2. Working as Model Farmers

- Extension workers serve as **model farmers**, demonstrating best practices and innovative agricultural techniques in their own farms.
- By using new technologies and methods, they set an example for other farmers to follow.
- For example, they may adopt new crop varieties, modern irrigation methods, or organic farming techniques and show the results of these practices.

3. Collecting Agricultural Data

- Extension workers gather important agricultural data from the field, such as crop performance, pest infestations, soil health, and weather patterns.
- This data is crucial for planning future agricultural policies, improving farming practices, and monitoring the success of extension programs.
- Extension workers use this information to guide farmers in making better decisions based on real-time conditions.

4. Motivating Farmers to Adopt New Technologies

- One of the most important roles of extension workers is to motivate farmers to adopt **new technologies and practices.**
- They provide training, demonstrations, and one-on-one consultations to showcase the benefits of modern agricultural methods, such as improved seed varieties, advanced irrigation systems, and eco-friendly pest control techniques.
- Extension workers also provide encouragement and support, helping farmers overcome any fears or doubts about adopting new technologies.

5. Facilitating the Demand for Agricultural Inputs and Rural Credit

- Extension workers assist in identifying and collecting demand for agricultural inputs such as seeds, fertilizers, tools, and machinery.

- They also help farmers access **rural credit** by providing information on available loans or financial assistance programs for purchasing inputs or improving farm infrastructure.
- By linking farmers with financial resources and necessary inputs, extension workers help farmers invest in technology that can enhance productivity.

6. Assisting in Local Fairs and Exhibitions

- Extension workers play an active role in organizing or assisting in **local fairs and exhibitions**. These events showcase the latest agricultural technologies, tools, and practices.
- At such events, farmers have the opportunity to see demonstrations, ask questions, and interact with experts in the field.
- Extension workers may organize workshops, field visits, or provide live demonstrations during these events to encourage farmers to try new practices and technologies.

Exercise

Choose the correct answer from the given alternatives.

1. What is the main role of communication in extension education?

   a. To transfer ideas from one person to another accurately and satisfactorily.

   b. To entertain farmers with stories.

   c. To promote sales of agricultural products.

   d. To collect agricultural data.

2. What is the first step in the extension teaching-learning process?

   a. Interest b. Desire

   c. Attention d. Action

3. Which of the following methods is part of group contact in extension education?

   a. Home visits b. Personal calls

   c. Method demonstrations d. Office calls

4. Which method of communication involves direct interaction with a single person?

   a. Mass contact b. Group contact

   c. Individual contact d. Radio broadcast

5. In the extension teaching-learning process, what happens during the 'Conviction' step?

   a. The learner is convinced to take action.

   b. The learner becomes satisfied with the results.

   c. The extension worker convinces the learner that the new practice is worth adopting.

   d. The learner develops interest in the topic.

6. What is the main advantage of using mass contact methods?

a.Immediate feedback from participants

b. Reaching a large number of people quickly

c. Personalized communication

d. Building trust and rapport

7. What role does an extension worker play as a model farmer?

a. Helping farmers collect data

b. Demonstrating new practices on their own farm

c. Providing financial support to farmers

d. Organizing community fairs

8. What is the purpose of using the 'Action' step in the extension teaching-learning process?

a. To encourage the learner to adopt new technology or practices.

b. To convince the learner to try the practice.

c.To create interest in the new idea.

d. To evaluate the success of the practice.

Write short answer to the following questions.

1. Define communication in extension education. How does it play a role in transferring knowledge to farmers?
2. List and explain the first two steps in the extension teaching-learning process.
3. What are the advantages and disadvantages of individual contact as a communication method in extension education?
4. What is the role of extension workers in motivating farmers to adopt new technologies?

Write long answer to the following questions.

1. Explain the six steps in the extension teaching-learning process and their

significance in ensuring successful adoption of new practices.

2. Discuss the three primary methods of communication used by extension workers: individual, group, and mass contact. Provide examples of each.

Project Work

1. Imagine you are an extension worker who has to introduce a new agricultural technology or farming method (such as composting, drip irrigation, or improved seed variety) to farmers in a rural village of Nepal.
2. Your task is to prepare a detailed extension communication plan explaining how you will successfully communicate this new idea to the farmers using the steps and methods of extension education.

Basic sociological concept

Unit 3

3.1 Concept of Sociology and Rural Sociology and Their Importance in the Development Process

Sociology

Sociology is the scientific study of human relationships and interactions in a society. It focuses on how people organize themselves into groups, how they behave in these groups, and how these social systems evolve over time.

Sociology is the study of society which studies: how people live, work, and interact in groups among each other. It helps us understand how family, school, religion, culture, and other parts of life shape our behavior, thoughts, and relationships. Sociology helps in understanding farmer's traditions, beliefs, and practices which helps in effective sharing and application of new ideas.

Rural Sociology

Rural sociology is the study of life, people, and problems in villages and rural areas. It looks at how people in the countryside live, work, and interact with each other, and how their traditions, culture, and environment shape their lives.

Most farmers live in rural areas. The main occupation of people living in the rural areas is agriculture. It helps understand farmers' traditions, beliefs, customs, and how these affect their farming methods. By studying rural society, experts can suggest better ways to introduce modern farming techniques that suit the local culture. It also supports planning for rural progress, including better farming, irrigation, education, and health. By studying the life of rural people, it helps solving issues like land disputes, unemployment, migration, and lack of education that directly or indirectly affect agriculture.

Rural sociology is the study of people who live in rural areas, their social

relationships, behaviors, and structures, such as villages or farming communities. It focuses on understanding the lives, traditions, beliefs, problems and challenges of people living in rural areas, including farming, community cooperation, and the impact of development. Rural sociology helps in learning how to work with rural communities to improve their farming practices and quality of life.

Importance of Sociology and Rural Sociology in the Development Process

1. Understanding Rural Society

Sociology helps us understand how people live, think, and behave in society. This knowledge is important for making better development plans. It helps to analyze the behavior, needs, goals and aims of rural people.

2. Identifying Barriers to Development

Rural sociology helps to identify the problems and barriers in the development process, enabling better planning and execution.

3. Improving Social Harmony

It helps to understand the social relationship and behavior of people which helps to create peaceful communities.

4. Cultural Preservation and Progress

Villages and rural societies are the cultural backbone of a country. Their study helps in cultural preservation and enhancement.

5. Aiding Policy and Reform

Helps design and implement policies for economic betterment, education, and rural planning.

6. Addressing Social Inequalities

Rural sociology can identify issues of caste, class, gender, and age-based inequalities, helping to bridge social gaps.

3.2 Key Sociological Terminologies

1. Family

Family is the basic social unit in society. It usually consists of parents and

their children who live together and share love, care, and support. Families help individuals grow by teaching them values, customs, and how to behave in society. It serves as the primary unit of socialization, teaching roles, responsibilities, and values. It is important because it provides emotional support and helps in the upbringing of children. Families can be small (nuclear family) or larger (joint or extended family) depending on who lives together.

2. Group

A group is a collection of people who come together because they have something in common or share a goal. People in group may interact, work, or spend time together. For example, friends, classmates, or members of a club form groups. Groups help people feel they belong and allow cooperation and teamwork. Groups can be small or large, formal or informal.

3. Community

A community is a larger social unit made up of many families and groups living in the same area or sharing common interests. People in a community often share traditions, culture, and resources. It can be a village, town, or neighborhood where people know each other and help one another. Communities support their members and work together for common goals like safety, health, and education.

4. Institution

Institutions are important and organized systems in society that help meet people's needs and keep society working smoothly. Examples include family, schools, religion, government, and the economy. Each institution has its own roles and rules, such as schools providing education or government making laws. Institutions guide how people behave and interact in society to maintain order and support development.

5. Social Structure

Social structure refers to the organized way in which people in a society

interact and live together. It includes patterns of relationships, roles, and rules that shape how individuals and groups behave. Examples of social structures include families, communities, schools, governments, and religious organizations. In agriculture extension, understanding social structure is important because it helps identify key community leaders, decision-making processes, and social norms that can influence the success of agricultural programs.

6. Social Customs

Social customs are the traditional practices, behaviors, and rituals followed by people in a society. These are unwritten rules that guide how individuals celebrate events, interact with others, and carry out daily activities. Customs vary from one culture or community to another and are often passed down from generation to generation.

For example, in rural farming communities, social customs might include specific ways of celebrating harvest festivals, conducting weddings, or helping neighbors during planting or harvesting.

In agriculture extension, understanding social customs is important because it helps in respecting local traditions while introducing new farming practices.

7. Social Norms and Values

Social Norms

Social norms are unwritten rules about how people are expected to behave in different situations. They define what is considered acceptable or unacceptable in a society. Norms can vary depending on the culture, group, or situation. Saying "thank you" after receiving help is a social norm. In a rural community, helping a neighbor during planting or harvesting might be a norm.

Values

Values are the core beliefs and principles that a society considers important.

They shape people's attitudes, priorities, and decisions. Values are more abstract and remain relatively stable over time. Honesty, respect for elders, and hard work are common values in many societies. In farming communities, the value of cooperation and respect for nature might be emphasized.

For agriculture extension, understanding social norms and values helps in designing programs that align with the beliefs and behaviors of the community.

8. Social Stratification

Social stratification refers to the way society is divided into different layers or groups based on factors like wealth, power, education, occupation, or social status. It shows the hierarchy in society, where some groups have more privileges, resources, and influence than others. Understanding social stratification helps agriculture extension workers identify influential groups in the community, address inequalities, and ensure that resources and programs benefit everyone, including marginalized groups.

9. Social Process

Social process refers to the ongoing activities and interactions that shape the behavior, relationships, and structure of a society. It involves the ways in which individuals and groups come together, influence each other, and create patterns of social life. These processes help maintain social order and bring about social change.

10. Culture and Beliefs

Culture

Culture means the way of life of a group of people. It includes their habits,customs,language, art, music, and traditions that people share and pass from one generation to another. Culture shapes how people behave, what they value, and how they see the world. For example, festivals, food, and ways of greeting are parts of culture. It helps people feel connected and belong to their community.

Beliefs

Beliefs are the ideas and feelings that people think are true about themselves and the world. They can be about religion, values, right and wrong, or how life works. Beliefs guide how people live and make decisions. For example, some people believe in kindness and helping others as very important. Beliefs are often shaped by culture and family.

11. Socialization

Socialization is the process by which people learn the rules, behavior, and culture of their society. It happens when we grow up by watching, listening, and practicing what others do. Family, school, and friends help in socialization. It teaches us how to act, speak, and behave properly with others. For example, children learn to say "please" and "thank you" through socialization in their families and schools.

3.3 Concept and History of Social Mobilization in Nepal

Concept

Social mobilization is the process of organizing and encouraging people in a community or society to actively participate in solving common problems, improving their lives, and influencing decisions that affect them. It involves raising awareness, sharing information, building groups or networks, and empowering citizens, especially marginalized or disadvantaged groups, to take collective action. The goal is not just individual benefit but creating lasting social change through participation, cooperation, and inclusion. In Nepal, social mobilization has played an important role in empowering communities, fostering participation in local governance, and supporting poverty reduction efforts. It is used to engage people in activities like development programs, voter participation, health campaigns, and resource management, helping them understand their rights and roles in society.

History in Nepal

Social mobilization in Nepal evolved from traditional caste-based systems to modern participatory and inclusive approaches. It has been shaped by political

changes. Today, it plays a vital role in empowering marginalized communities, improving livelihoods, and supporting sustainable development, particularly in agriculture and rural areas.

1. **Early Traditional Systems (Pre-1950)**
   - Informal mobilization through guthis and caste-based systems.
   - Community efforts focused on religious and cultural events with limited inclusion.
2. **Panchayat Era (1960-1990)**
   - Top-down mobilization, like the Back to the Village National Campaign (1975), aimed at rural development but lacked genuine community participation.
   - Centralized power under the monarchy limited grassroots empowerment.
3. **Democracy and Civil Society Growth (Post-1990)**
   - Restoration of democracy led to the rise of NGOs and participatory approaches.
   - Focus on empowering marginalized groups and promoting local development through community engagement.
4. **Post-Conflict Period and Federalism (2006 Onwards)**
   - Emphasis on rebuilding communities, inclusivity, and participatory governance.
   - Programs like Poverty Alleviation Fund (PAF) and Local Governance and Community Development Program (LGCDP) empowered local communities.
5. **Present-Day Focus**
   - Addressing issues like women's empowerment, climate change, disaster resilience, and sustainable agriculture through cooperatives and local governments.
   - Federalism has decentralized governance, strengthening local-level

mobilization.

3.4 Objectives of Social Mobilization in Extension

1. Community Empowerment

Social mobilization helps communities gain confidence and skills to take control of their own development. It encourages people to participate in decisions that affect their lives.

2. Participation in Development

It brings people together to work on common projects like health or education, so development meets their real needs. This makes development more effective and sustainable.

3. Enhancing Resource Utilization

Social mobilization teaches communities how to use their local resources wisely and connect with available support. This helps improve productivity and reduce waste.

4. Building Social Capital

It strengthens trust and cooperation among community members, making it easier to solve problems together. Strong social bonds support shared activities and development.

5. Reducing Inequalities

Social mobilization includes marginalized groups like women and minorities in development activities. This helps reduce social and economic gaps in society.

6. Promoting Behavioral Change

It raises awareness about important issues and encourages positive habits, such as better health and environmental care. This leads to healthier and more sustainable communities.

Exercise

Choose the correct answer from the given alternatives.

1. What does sociology primarily study?
   a. Economic systems of rural areas
   b. Human relationships and interactions in a society
   c. Political structures in urban centers
   d. Technological advancements in agriculture

2. Which of the following is a key focus of rural sociology?
   a. Industrial development in cities
   b. Rural life, relationships, and social processes
   c. Political campaigns in rural areas
   d. Urban migration patterns

3. Why is rural sociology important in the development process?
   a. It exclusively studies urban culture.
   b. It promotes industrial growth in rural areas.
   c. It helps address social inequalities like caste and gender disparities.
   d. It discourages traditional customs in rural regions.

4. What is a 'community' as per sociological terminologies?
   a) A group of people sharing a common job
   b) An organized system of rules and laws
   c) A group living in the same geographical area with shared interests
   d) A government institution

5. What is social stratification?
   a. The process of integrating new cultural practices
   b. The division of society into strata based on caste, class, gender, or age

c. The framework of societal institutions and norms

d. The traditional practices of rural areas

6. Which of the following was a significant milestone for social mobilization in Nepal post-1990s?

a. Launch of Small Farmer Development Program (SFDP)

b. Nepal's industrial revolution

c. Emphasis on urban migration policies

d. Establishment of a monarchy system

Write short answer to the following questions.

1. List any five reasons why rural sociology is important in the development process.
2. What are the role of social norms and values in society? Explain.
3. List any five objectives of social mobilization in agricultural extension.
4. Define family and explain the importance of family in present context.

Write long answer to the following questions.

1. Define sociology and rural sociology. Discuss the importance of rural sociology in the development process.
2. Explain the key sociological terminologies, such as family, group, community, institution, and social structure, with examples.
3. What is social stratification? Discuss its impact on rural society, with reference to caste, class, and gender inequalities.
4. Discuss the concept of social mobilization and its historical development in Nepal. Highlight its role in rural development.

Project Work

Title: Understanding the Role of Sociology and Rural Sociology in Rural Development

1. Farmers in your village face several challenges such as low productivity,

traditional farming methods, unemployment, and migration of youth to cities. Despite government programs and NGO efforts, development has been slow. One reason could be that these programs do not fully consider the traditions, beliefs, social norms, and community structures of the rural people.

As a sociology student, you are assigned to study how sociological factors (family, groups, community, institutions, customs, norms, values, stratification, etc.) and social mobilization can help improve the lives of rural farmers and support rural development.

Task

a. Select a rural community (real or imaginary).
b. Identify at least three major social factors that affect the daily life and farming practices of the community.
c. Explain how rural sociology can help in addressing the problems (e.g.,migration, unemployment, low productivity).
d. Suggest two ways of social mobilization that could empower farmers and improve community development.
e. Present your findings in a short written report (2–3 pages) or a group presentation, using examples from your own area if possible.

Unit 4

Extension Program Planning, Monitoring and Evaluation

4.1 Program Planning

Program planning is the process of making a clear plan before starting any project or activity. It helps to decide what needs to be done, who will do it, and when it will happen. Good planning shows the steps to follow and the resources needed, like money, people, and materials. It also helps to set goals so we know what we want to achieve. Program planning makes work organized and saves time and effort. In farming or community programs, careful planning helps ensure success and benefits for everyone involved.This process answers key questions like:

- **What** will be done?
- **When** will it happen?
- **Where** will it take place?
- **Who** will be involved?
- **How** will it be done?

4.2 Principles and Importance of Program Planning

Principles of Program Planning

1. Community Participation

Actively involve the community in identifying needs, setting objectives, and decision-making processes. This helps ensure the program is relevant and accepted by the people it aims to serve. When the community takes part, they feel ownership and responsibility, which increases the chances of success.

2. **Flexibility**

The program should adapt to the changing needs, resources, and conditions

of the target audience or community. Flexible programs can respond to unexpected challenges and new opportunities, making them more sustainable. Being open to change allows the program to stay useful and effective over time.

3. **Fact-Based Decision Making**

Use reliable data and information to identify problems and resources, ensuring the program is relevant and effective. Decisions based on facts help avoid assumptions and reduce the risk of failure. Collecting and analyzing data also helps track progress and measure the impact of the program.

4. **Resource Optimization**

Make the best use of available human, financial, and material resources to avoid wastage and duplication of efforts. Efficient use of resources helps achieve more with less, saving time and money. Proper planning of resource allocation ensures that all parts of the program are well supported.

5. **Prioritization of Needs**

Focus on addressing the most pressing and significant problems that impact the community. Prioritizing helps concentrate efforts and resources on areas that will create the greatest positive change. It prevents spreading too thin and ensures measurable outcomes.

6. **Balanced Development**

Ensure all areas of need (economic, social, environmental) are addressed for holistic growth. A balanced approach prevents neglecting important issues and supports sustainable community progress. Programs should aim to improve overall well-being, not just one aspect.

7. **Simplicity**

Programs should be simple and easy to understand so that participants can implement them effectively. Clear goals, instructions, and methods help avoid confusion and mistakes. Simplicity also makes training easier and

encourages wider participation.

8. Coordination and Integration

Collaborate with various organizations, departments, and stakeholders to avoid duplication and ensure a unified approach. Effective coordination maximizes the use of resources and expertise. Integration helps build partnerships and strengthens the impact of the program.

9. Evaluation and Feedback

Regularly monitor and evaluate the program to assess progress and make necessary adjustments for improvement. Feedback from participants and stakeholders is vital for learning what works and what does not. Continuous evaluation helps keep the program aligned with its goals and community needs.

Importance of Program Planning

Program planning is important because it:

1. Program planning helps to set clear goals so every one knows what needs to be done and how to do it.
2. It helps avoid wasting time, money, and materials by organizing everything before starting.
3. It makes tasks more organized, so work is done smoothly without confusion or delays.
4. Good planning can adapt to changes and new ideas, making the program more successful.
5. When a plan is shared, everyone involved understands their role and works together better.
6. Planning helps to check progress and make changes if something is not working well.

4.3 Monitoring, Evaluation and Follow-Up

1. Monitoring

Monitoring is the continuous and systematic observation of program

activities to ensure they are being implemented as planned and to identify areas for improvement. In an agricultural training program, monitoring is to check whether all scheduled workshops are conducted on time, participants are attending, and training materials are available.

Importance of Monitoring

- Monitoring shows how well the program is going and if it is meeting its goals on time.
- It helps find problems early, so they can be fixed before they become bigger issues.
- Monitoring checks that money, materials, and people's time are used efficiently without waste.
- It provides clear updates to everyone involved, including funders, and participants, building trust.
- Monitoring helps show whether the program is successful or not, making it accountable to stakeholders.

2. Evaluation

Evaluation is the process of assessing the outcomes and overall success of a program to determine if its objectives were achieved and to measure its impact on the target group. After completing a soil fertility program, evaluation involves determining whether farmers have adopted the recommended practices and if their crop yields have improved.

Importance

- It measures the effectiveness and impact of the program.
- It identifies strengths and weaknesses for future improvements.
- It provides reliable data to justify the program’s value.
- It motivates stakeholders and enhances planning for future initiatives.

3. Follow-Up

Follow-up refers to the support provided after the program to ensure participants adopt and sustain the new ideas, skills, or technologies

introduced during the program. After introducing a new irrigation method, follow-up might include extension workers visiting farmers to provide guidance on implementation and resolve any challenges.

Importance

- It reinforces learning and builds confidence among participants.
- It addresses difficulties during the adoption process.
- It ensures the long-term success and sustainability of program benefits.
- It strengthens relationships between extension workers and the community.

Difference Between Monitoring, Evaluation, and Follow-Up

Monitoring	Evaluation	Follow-Up
Continuous observation of program activities to ensure they are implemented as planned.	Assessment of the program's outcomes and overall success to measure its impact.	Post-program support to help participants adopt and sustain new practices.
To track progress, identify issues, and make timely adjustments.	To determine whether the program met its objectives and evaluate its effectiveness.	To ensure participants successfully apply the new knowledge, skills, or technologies.
Conducted during program implementation.	Conducted at specific intervals, typically at the end or critical stages of the program.	Conducted after the program's completion.
Inputs (resources) and processes (activities).	Outputs (results) and outcomes (impact on participants).	Adoption and sustainability of the program's benefits.
Immediate feedback to improve ongoing activities.	Post-implementation insights for future planning.	Supportive feedback to address challenges in adoption.

Observation, checklists, and activity reports.	Surveys, interviews, and comparative data analysis.	Direct communication and field visits.
Ensuring workshops are conducted as scheduled and materials are distributed on time.	Checking if farmers' crop yields increased after applying new techniques.	Visiting farmers to help them use the introduced irrigation methods.
Maintains program efficiency and smooth operation.	Identifies the success and impact of the program.	Ensures long-term effectiveness and participant success.

4.4 Extension Program Planning Process

The 8 steps of program planning are:

1. **Collect Facts**

   Gather information about the community, their farming practices, resources, and problems. This helps to understand the situation clearly. For example, a survey might show that farmers in a village lack knowledge about pest control.

2. **Analyze the Situation**

   Study the information collected to find out the main problems and opportunities. This helps to focus on what is most important. For instance, analyzing might reveal that crop diseases are causing low yields.

3. **Identify Needs and Problems**

   Decide which gaps or issues need attention and resources. Prioritize the problems that affect the community the most. For example, farmers may need better seeds and training on pest management.

4. **Set Objectives**

   Decide what the program wants to achieve in clear and practical terms. Objectives should help solve the key problems and benefit

the community. For example, the goal could be “to increase farmers’ knowledge of pest control within six months.”

5. **Develop a Plan of Work**

   Create a step-by-step plan detailing activities, roles, and timeframes. This guides how the program will run. For instance, the plan could include organizing training sessions and distribution of pest-resistant seeds.

6. **Execute the Plan**

   Start the program by following the plan of work. This means carrying out training, demonstrations, or other activities. For example, extension workers may hold workshops where farmers learn new pest control methods.

7. **Evaluate Progress**

   Check if the program is meeting its goals and see how it is helping the community. Evaluation helps identify what is working well and what needs improvement. For example, measuring if farmers are using the new pest control techniques and if crop yields have improved.

8. **Reconsideration**

   Use lessons learned from evaluation to revise and improve future programs. This makes planning better and more effective next time. For example, if some methods did not work, the plan can be adjusted to include better approaches.

4.3. Meaning of Diffusion and Adoption

Diffusion

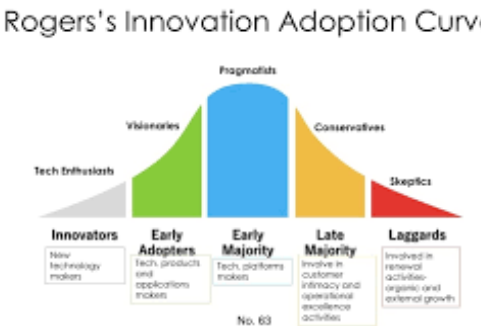
Diffusion means the way new ideas or farming techniques transfer from one person or place to many others. It is like sharing news or information about something useful so that more people learn about it. For example, when a scientist finds a better way to protect crops from pests, the information needs to reach farmers through meetings, demonstrations, or radios. Without diffusion, farmers would not hear about new methods.

Adoption

Adoption is the process by which individuals or groups decide to accept, use, and integrate an innovation (a new idea, practice, or technology) into their lives or practices. It focuses on the decision-making steps and behavioral changes required for individuals to transition from awareness to consistent use. Adoption happens when a farmer decides to try and continue using that new idea or method on their own farm. It is the farmer's choice to accept the change and put it into practice. Without adoption, the new methods would not improve farming in real life.

Categories of Adopters

The concept of **adopter categories** comes from the **Diffusion of Innovations Theory** by **Everett Rogers**. According to Rogers, individuals in a social system adopt new innovations at different rates. These categories help understand the speed and pattern of adoption across a population. The five categories of adopters are based on their openness to new ideas and their willingness to take risks in adopting innovations.



1. Innovators (2.5% of the population)

Innovators are the first individuals to adopt an innovation. They are risk-takers and are often willing to try new ideas or technologies before most others. Innovators are typically well-educated, have substantial financial resources, and are highly motivated by the desire for novelty or improvement.

Characteristics

- **Risk-takers:** Risk takers have willing to experiment with untested ideas and technologies.
- **Social Status:** They often have a high social standing due to their early adoption of new ideas.
- **Knowledgeable:** They usually have a strong interest in the area of innovation and access to new information.
- **Receptive to change:** They actively seek out new innovations.

2. Early Adopters (13.5% of the population)

Early adopters are individuals who follow innovators in adopting an innovation. They are opinion leaders in their communities and tend to have more social influence than innovators. They often serve as role models for others in the community and are crucial in influencing others to adopt the innovation.

Characteristics

- **Leaders within social groups:** They influence others to adopt the innovation.
- **High social status and respect:** They are respected in their communities and often trusted to make good decisions.
- **Educated and informed:** Typically well-educated and open to new ideas.
- **Cautiously optimistic:** They evaluate the innovation and make decisions based on perceived benefits.

3. Early Majority (34% of the population)

The early majority adopts innovations after they have been tested by early adopters. They are deliberate and cautious but are not as skeptical as the late majority. The early majority waits for proven benefits before committing to a new innovation. They make decisions based on the experiences of

early adopters and typically have less risk tolerance.

Characteristics

- **Deliberative:** They take time to weigh the advantages and disadvantages.
- **Less risk-tolerant:** They prefer to see proven results before adoption.
- **Mass market:** They represent a large portion of the population and are often critical in determining the success of an innovation.
- **Influenced by others:** They are persuaded by the experiences of the early adopters.

4. Late Majority (34% of the population)

The late majority adopts innovations after the majority of the population has already adopted them. They are typically more skeptical and cautious about change. This group adopts innovations only after they have become widespread and proven to be safe or beneficial. The late majority often faces social or economic pressures to adopt, such as the fear of being left behind or being forced to adapt to market changes.

Characteristics

- **Skeptical and cautious:** They adopt innovations only after a significant portion of society has accepted them.
- **Socially influenced:** They are pressured to adopt by social norms and peer influence.
- **Resource-limited:** They may have fewer financial or educational resources compared to earlier adopters.
- **Late acceptance:** They wait until the innovation is well-established.

5. Laggards (16% of the population)

Laggards are the last to adopt an innovation. They are resistant to change and often skeptical about new ideas. Laggards tend to have traditional values, limited access to information, and are highly influenced by their

close-knit social circle. They are often financially constrained or face cultural barriers to adopting new practices.

Characteristics

- **Highly skeptical:** Laggards resist change and are often unwilling to try new ideas.
- **Traditional:** They prefer maintaining established practices and often have strong ties to tradition.
- **Lower social and economic status:** They are typically less educated and have limited resources.
- **Conservative:** They will only adopt innovations when absolutely necessary, such as when they have no other option.

Exercise

Choose the correct answer from the given alternatives.

1. What is the primary purpose of program planning in extension?
   a. To reduce the workload of extension workers.
   b. To minimize wastage of resources and provide guidance.
   c. To enforce rules and regulations strictly.
   d. To ensure complete control over participants.

2. Which of the following is NOT a step in the extension program planning process?
   a. Setting objectives
   b. Collecting facts
   c. Distributing rewards
   d. Evaluating progress

3. What is the main focus of monitoring in an extension program?
   a. Motivating farmers to work harder.
   b. Observing activities and providing feedback.
   c. Punishing participants for non-cooperation.
   d. Preparing reports for higher authorities.

4. How does decentralization benefit an extension program?
   a. By centralizing authority to maintain control
   b. By allowing participants to make decisions democratically
   c. By ensuring that only extension workers can lead programs
   d. By eliminating the need for feedback

5. Which of the following is a key importance of evaluation in program planning?
   a. It helps plan future programs effectively.

b. It eliminates the need for monitoring.

c. It reduces the involvement of extension workers.

d. It focuses only on short-term achievements.

Write short answer to the following questions.

1. What is extension program planning? Explain the importance of extension program planning in agriculture.
2. List the principles of program planning. Explain any three of them.
3. Differentiate between monitoring and evaluation in extension programs.
4. Explain the concept of diffusion and adoption with examples.

Write long answer to the following questions.

1. Explain the concept of extension program planning. Discuss its importance in the development process.
2. Explain the steps involved in program planning process.
3. Describe the categories of adopters with their characteristics.

Project Work

Title: Planning and Evaluating an Agricultural Extension Program

1. Farmers in a nearby village are facing problems of low crop yield because of poor pest management. As extension students, you have been asked to prepare a simple program to help solve this problem using the principles of extension program planning.

Your Task

Program Planning

a. Identify the main problem faced by the farmers.

b. Set one clear objective (e.g., “to increase farmers’ knowledge of pest control within six months”).

c. Prepare a simple plan of work with at least 3 activities (e.g., training, demonstration, distribution of materials).

Monitoring

Suggest two ways you will monitor whether the activities are happening as planned (e.g., attendance records, field visits).

Evaluation

Explain how you will check if the program was successful (e.g., observing crop yield, asking farmers if they used the new methods).

Follow-Up

Suggest one follow-up activity to ensure farmers continue using the new methods (e.g., extension worker visiting farms after training).

Unit 5

Procedure of Group Formation and Its Role in Extension

The procedure of group formation explores how groups are created and developed to achieve common goals in a community or organization. In Nepal, forming a group often starts when villagers recognize the benefits of working together, such as accessing government subsidies or sharing resources. For the formation of a group, it usually requires a harmonious group with typically about 25 members for better coordination and effectiveness. The process involves bringing together people with similar interests, defining clear objectives, and organizing regular meetings. As the group develops, members take on roles, set rules, and build trust. Effective group fomation helps community members tackle shared problems, increase participation, and promote development activities in their village.

Steps in Group Formation

1. **Organize a Meeting with Interested Farmers**

   Gather farmers and community members who are interested in working together for government benefits, trainings, and improved agriculture. During the meeting, explain the advantages of forming a group, like getting subsidies and learning new skills. Allow everyone to share their ideas and concerns. For example, a local extension worker can call a meeting at the village to discuss group formation.

2. **Discuss and Set Clear Objectives**

   Decide what the group wants to achieve, such as applying for government subsidies, organizing training workshops, or purchasing farm equipment together. Having clear goals helps everyone work in the same direction and keeps the group focused. Take notes on each objective discussed in the

meeting. For instance, members may agree to apply for subsidized seeds and tools and invite experts to teach modern farming methods.

3. **Select Group Members and Ensure Willingness**

Choose members who share the same interests and agree to follow the group's goals and rules. Make sure everyone who joins the group is committed and willing to participate actively. A small group of 10-15 farmers is usually best for good coordination. For example, the group can consist of both men and women farmers who are motivated to improve their crops.

4. **Elect Group Leaders**

Select leaders like a chairperson, secretary, and treasurer to help manage the group's activities and finances. The leaders should be honest, respected, and able to work well with others. Voting can be conducted to make the process fair and transparent. For example, members can vote to choose a trusted village elder as the group's chairperson.

5. **Develop Rules and a Work Plan**

Create simple rules for how the group will operate, make decisions, hold meetings, and handle money. Also, prepare a work plan outlining activities, important dates, and who is responsible for different tasks. Clear rules and plans help prevent misunderstandings and conflicts. For example, the group might decide to meet every month and save a small amount of money for emergencies.

6. **Register the Group with Local Authorities**

Complete the formal process of registering the group with the ward office or agricultural department. Registration makes the group recognized by the government and eligible for subsidies or programs. Prepare documents like a list of members, objectives, meeting minutes, and identification. For example, the secretary can submit these documents to the local ward office to receive official recognition.

7. Start Group Activities

Begin working as a group by applying for subsidies, attending training, or starting joint farming activities. Encourage all members to participate, share updates, and support each other. Track progress and celebrate small achievements together to keep the group motivated. For instance, after registration, the group might apply for discounted fertilizers and invite an expert to demonstrate proper use.

8. Monitor, Evaluate, and Adjust

Regularly review the group's progress, address any problems, and make improvements as needed. Ask members for feedback after every major activity or meeting. This helps the group stay active, solve issues early, and achieve its objectives more effectively. For example, if attendance drops, the members can discuss ways to make meetings more convenient for everyone.

By following these steps, villagers can successfully form and run an agricultural group that brings greater benefits and learning opportunities to all members.

Role of Groups in Extension

The role of groups in extension is very important for improving farming and community life. Groups like farmer cooperatives help share new farming methods, tools, and government programs with many people at once. When farmers work together, they can solve problems, share resources, and learn from each other more easily. Extension services support these groups to become strong and independent. Groups also encourage participation and cooperation, making farming more effective and profitable. This group approach is widely used because it helps communities grow and develop together.

1. Accepting Innovations

Groups help members learn about new farming ideas or tools. For example, farmers in a group may hear about a new seed that protects crops better and

decide to try it together.

2. Skill Development

Groups give chances for farmers to learn new ways to farm better. For instance, a group may hold a class to teach how to use natural fertilizers.

3. Problem Solving

Farmers in a group work together to fix problems they all face. For example, if water is short, the group might build a small water system to share.

4. Collective Action

In a group, members share money and tools to do things that are hard to do alone. For example, they may pool money to buy a machine that helps all of them.

5. Setting Objectives

Groups make simple goals to help everyone, like keeping crops safe after harvest. For example, they may agree to build a storage place to keep grains from spoiling.

These ideas show how working in groups makes farming easier and helps people help each other.

5.3 Meaning and Types of Leadership

Leadership

Leadership is the ability to guide, influence, and motivate a group of people to work together towards a common goal. A leader helps others understand what to do and encourages them to do their best. Good leadership is not just about giving orders but also about listening, supporting, and making decisions that benefit the whole group. Leaders can be found everywhere- in villages, schools, workplaces, and communities. They inspire people to solve problems and bring positive changes. Simple examples include a village elder helping farmers organize better irrigation or a teacher encouraging students to work hard. In short, leadership is about helping people come together and achieve something valuable as a team.

Types of Leaders

1. Traditional Leaders

Traditional leaders follow the customs and traditions that have been passed down for a long time. They often prefer to keep things the same and may resist new ideas or changes. For example, a village elder who values old ways of farming might be a traditional leader.

2. Democratic Leaders

Democratic leaders involve other group members in making decisions. They encourage everyone to share their opinions and work together as a team. This type of leadership helps build trust and cooperation among members.

3. Autocratic Leaders

Autocratic leaders are those type of leaders who do not like consulting with other members to take any decision. They make decisions on their own without asking others for advice. This style can be useful in emergencies when quick action is needed. However, it may make others feel less involved in the group.

4. Action Leaders

Action leaders act as a link between researchers or experts and farmers. They help explain new ideas or methods and assist farmers in using them. Their role is important for making sure information reaches the right people and is put into practice.

5. Professional Leader

Professional leaders are experts with special knowledge or skills, like agricultural officers or extension workers. They use their expertise to guide and support farmers and groups. These leaders help bring scientific knowledge to practical use in farming communities.

5.4 Characteristics of a Good Leader

1. Vision

A good leader has a clear idea of what they want to achieve in the future. This vision helps guide the group toward their goals and inspires members to work with hope and purpose. For example, a village leader might have a vision to improve farming by introducing new irrigation methods.

2. Knowledge

Leaders need to know a lot about the subject they are leading, such as farming or community work. This helps them make good decisions and give useful advice to others. For instance, an agricultural leader should understand modern farming techniques.

3. Empathy

A good leader cares about the feelings and needs of group members. They listen and try to understand others' problems and support them. For example, a leader may help a farmer facing difficulties by finding solutions or offering encouragement.

4. Flexibility

Leaders should be ready to adapt plans or change their style when situations are different or new challenges come up. Being flexible helps solve problems faster and keeps the group moving forward. For example, if a new pest affects crops, the leader might quickly organize training to tackle it.

5. Ethics

Good leaders act honestly and do what is right, even when no one is watching. They keep promises, are fair to everyone, and follow moral principles. A leader, for example, should distribute resources equally without favoritism.

6. Good Listener

A good leader listens carefully to what others say and respects their opinions.

This helps the leader make better decisions that include everyone's needs.

7. **Clear Communicator**

   A good leader explains ideas and plans in a way that everyone understands. Clear communication stops confusion and helps the group work smoothly.

8. **Honest**

   A good leader always tells the truth and can be trusted by others. Honesty helps people believe in the leader and feel confident to follow them.

9. **Responsible**

   A good leader accepts responsibility for their actions and decisions. They do not blame others when things go wrong but try to fix problems.

10. **Motivator**

    A good leader encourages and inspires members to do their best. They stay positive and help the group remain focused on their goals.

11. **Fair**

    A good leader treats all members equally and makes decisions without favoritism. Fairness helps build trust and unity in the group.

12. **Patient**

    A good leader understands that change and progress take time. They are patient and keep working steadily, even when facing difficulties.

5.5 Meaning of Motivation and Factors Affecting It

Meaning of Motivation

Motivation is the reason that pushes a person to take action and keep working towards a goal. It is what helps people stay interested, overcome challenges, and do their best in any task, whether it is farming, studying, or working in a group. Motivation can come from inside a person, like their own dreams and interests, or from outside, such as rewards or encouragement from other.

Motivatioon is a psychological force that starts, directs, and sustains people's efforts to achieve goals. It involves the decision to take action (activation), the

energy and effort put into reaching the goal (intensity), and the ability to keep going despite obstacles (persistence). Motivation can come from inside a person, like personal interest or finding joy in an activity (intrinsic motivation), or from outside rewards such as praise, money, or social approval (extrinsic motivation). It acts like a driving force that explains why people begin, continue, or stop certain behaviors at different times. For example a farmer might be motivated by the hope of a better harvest, the need to provide for family, or recognition from the community.

Factors Affecting Motivation

1. **Personal Interest**

   Personal interest is when someone feels a natural liking or curiosity about an activity. When people enjoy what they do, they are more willing to work hard and keep trying even if things get difficult. For example, a farmer who loves growing vegetables will be motivated to learn new ways to improve their farm because it matters to them personally.

2. **Recognition**

   Recognition means getting praise or rewards for a job well done. When people are appreciated or acknowledged for their efforts, they feel happy and encouraged to continue their good work. For instance, a farmer who receives a certificate for good crop production may feel motivated to keep improving.

3. **Social Environment**

   The social environment includes friends, family, and community members who support or influence a person. Positive support and encouragement from others can boost motivation, while negative pressure can lower it. For example, if a farming group encourages each other to try new techniques, members will be more motivated to participate.

4. **Resources**

   Having the necessary tools, money, information, or training makes it easier for people to do their work well. When resources are available, motivation

increases because people feel more capable of achieving their goals. For example, farmers who get access to quality seeds and fertilizers feel motivated to grow better crops.

5. **Clear Goals**

Knowing exactly what to achieve helps people stay focused and motivated. Clear goals give a sense of direction and make it easier to measure progress. For example, if a group of farmers sets a goal to increase wheat production by 20%, they have a target to work towards.

6. **Leadership**

Good leadership provides guidance, support, and encouragement, which can inspire people to work harder. A motivating leader listens to members, solves problems, and helps the group stay positive. For instance, a village agricultural officer who motivates farmers to attend training sessions can increase their enthusiasm.

7. **Opportunities for Growth**

Having chances to learn new skills or get promoted motivates people to keep improving themselves. When people see that their efforts can lead to better knowledge or higher positions, they work with more interest. For example, farmers who attend training and become group leaders feel motivated to continue participating actively.

5.6 Cooperatives

A cooperative is an autonomous organization owned and controlled by its members who voluntarily come together to meet their common economic, social, and cultural needs and aspirations through a jointly owned and democratically controlled enterprise. Members typically use the cooperative's products and services and share the decision making process equally, regardless of their investment size. The cooperative operates primarily to serve the members' interest rather than to maximize profits, focusing on mutual benefit, fairness, and community support. This democratic structure allows each member to have one vote in governance, emphasizing equality and collective participation.

Historical Context in Nepal

Before the establishment of cooperatives, various informal institutions have been established such as Guthi, Bhakari, Parma similar to the concept of cooperative. Modern co-operatives began in Nepal in 1954 when a Department of Co-operatives (DOC) was established within the Ministry of Agriculture. Department of Cooperatives was established to promote and assist development of co-operatives. Nepal's first cooperatives emerged in Chitwan (1956) during a flood relief and resettlement program. The cooperative movement started after democracy was established in 1990. Cooperative act 1992 and cooperative rules 1993 made a foundation for establishing cooperatives in Nepal.

Principles of Cooperatives

1. **Voluntary Membership**

   Anyone can join a cooperative freely without any discrimination based on gender, race, caste, or social status. This openness encourages more people to participate and benefit from the cooperative's activities. For example, farmers from different backgrounds in a village can become members.

2. **Democratic Decision-Making**

   Every memebr has an equal right to take part in making decisions, usually by voting. This ensures fairness and that no one person controls the cooperative. For instance, all members vote to choose leaders or decide on important issues.

3. **Member Economic Participation**

   Members contribute money to the cooperative and share in the profits based on how much they invest or use its services. This make everyone responsible and motivated to help the cooperative succeed. For example, if a member buys more from the cooperative, they receive a larger share of the benefits.

4. **Autonomy and Independence**

   Cooperatives manage their own affairs without outside control, even if they

get support from the government or other organizations. This independence helps them work freely for the benefit of their members. For example, a cooperative decides how to use its money and resources on its own.

5. **Education, Training and Information**

Cooperatives provide learning opportunities to members and the community to improve their skills and financial knowledge. This helps members make better decisions and grow economically. For instance, cooperatives may hold workshops on saving money or managing farm businesses.

6. **Cooperation among cooperatives**

Cooperatives help and support each other by working together at different levels-local, national, or international. This teamwork strengthens their power resources. For example, two local cooperatives may join forces to buy machinery at a lower cost.

7. **Concern for community**

Cooperatives aim to improve the entire community's welfare, not just their own profits. They work on projects that benefit people around them, like building schools or cleaning water sources. This shows their responsibility toward social development.

Role of Cooperatives in Rural Development

Cooperatives play a very important role in rural development by helping farmers and villagers work together to improve their lives. These groups allow people to pool their resources, share knowledge, and access services that might be hard to get alone. Cooperatives help members get loans at low interest rates, buy or sell goods at fair prices, and organize training for better farming methods. They also reduce the power of middlemen who often exploit small farmers. By working democratically, cooperatives build a sense of ownership and unity among members, which strengthens the whole community. Overall, cooperatives support economic growth, increase incomes, and improve living standards in rural areas.

Roles of Cooperatives in Rural Development

- **Providing Credit Facilities**

  Cooperatives offer loans to farmers and rural people at low interest rates, helping them buy seeds, tools, or other farming needs. This reduces their reliance on moneylenders who charge high rates. For example, a cooperative might lend money to a farmer to buy fertilizers for a better crop yield.

- **Helping with Marketing**

  Cooperatives help farmers sell their products together so they can get better prices and avoid unfair middlemen. By pooling their harvest, members can enter bigger markets and increase their profits. For instance, a grain marketing cooperative sells crops directly to buyers, ensuring farmers get fair pay.

- **Organizing Training and Skill Development**

  Cooperatives arrange training sessions to teach members new farming techniques and better ways to manage resources. This helps farmers improve their productivity and income. For example, a cooperative may invite experts to train farmers on pest control or irrigation methods.

- **Supplying Affordable Inputs**

  They buy and provide seeds, fertilizers, and tools to members at lower costs by buying in bulk. This makes farming inputs more affordable for small farmers. For example, cooperative members might buy quality seeds together, reducing the cost per farmer.

- **Promoting Social Welfare**

  Cooperatives also work to improve the overall well-being of their members by supporting education, health services, and community projects. This helps raise the standard of living in the village. For example, a cooperative might fund a local health camp or build a community center.

- **Encouraging Democratic Participation**

All members have a say in the decisions and share profits fairly, which builds trust and unity. This democratic way of working helps everyone feel responsible and involved. For instance, members vote to elect leaders and decide on important group matters.

- **Creating Employment Opportunities**

  Cooperatives create jobs in rural areas by starting small businesses or processing units that employ local people. This helps reduce unemployment and improves the local economy. For example, a cooperative might run a small rice milling business that hires community members.

Exercise

Choose the correct answer from the given alternatives.

1. What is the primary principle of a group in agriculture extension?
   a. Individual decision-making b. Common objectives
   c. Profit maximization d. Competing interests

2. What was the first cooperative formed in Nepal for?
   a. Education program b. Flood relief and resettlement
   c. Marketing agricultural produce d. Savings and credit activities

3. Which of the following is a factor affecting motivation?
   a. Vision b. Flexibility
   c. Personal interest d. Autonomy

4. What is the role of cooperatives in rural development?
   a. Eliminating middlemen b. Promoting individual goals
   c. Reducing agricultural practices d. Supporting urban development

5. Which type of group helps manage water, soil, or forests?
   a. Production group b. Resource management group
   c. Marketing group d. Savings-and-credit group

6. Which type of leader believes in democratic ideals and teamwork?
   a. Autocratic leader b. Democratic leader
   c. Laissez-faire leader d. Situational leader

Write short answer to the following questions.

1. Define a group and explain its key principles.
2. List the steps involved in forming a group in agriculture extension.
3. List the characteristics of a good leader.

4. Define motivation. List the factors affecting motivation.
5. Explain the principles of cooperatives.

Write long answer to the following questions.

1. Discuss the role of cooperatives in rural development and highlight their importance in Nepal's agricultural sector.
2. Describe the different types of leaders and explain their relevance in rural communities.
3. What are the various types of farmer groups in agriculture extension? Explain their roles and benefits.
4. Define cooperatives. Explain the roles of cooperatives in rural development.

Project Work

Simulate a group formation process in your classroom including all the students.

Instructions:

a. Organize initial meeting to set objectives.
b. Discuss to decide chairman, secretariat, treasurer, and members.
c. Develop rules and work plan of the group.
d. Conduct group activities.
e Present a report (2-3 pages) including all the process involved in the group formation, mentioning group leaders, rules of the group, and activities conducted by the group. Also mention your learning from this work at the end of your report.

Gender and Development

Unit 6

6.1 Introduction to Gender Concept: Gender Segregation and Discrimination

Gender

Gender is a social concept that describes the roles, behaviors, and expectations that societies assign to people based on whether they are male, female, or other genders. Unlike biological sex, which is determined by physical and genetic traits, gender is shaped by cultural, economic, and social meanings that change over time and very between communities. It influences how men, women, and other gender identities participate in family, work, and community life. Gender is not fixed but learned, and it affects access to power, resources, and opportunities. Understanding gender helps reveal inequalities and promts efforts to promote fairness and equal participation for all genders. The goal is to create a society where everyone has the freedom to pursue their abilities without restrictions based on gender roles. Ultimately, gender is about the social relationships and expectations that shape our lives beyond biology.

In rural areas of Nepal, women are mostly involved in certain works such as transplanting seedlings, rearing animals, household activities, etc and male are expected to do physically demanding works like tillage, other works like marketing of the produce, buying agricultural inputs etc. The term gender and sex are intertwined but are distinct. Sex is biological and gender is a persons identity guided by societal norms.

Gender Segregation

Gender segregation is the systematic separation of individuals based on their gender, resulting in different roles, responsibilities, and opportunities for men

and women in various social settings. This separation can be physical, social, or cultural, and is commonly seen in workplaces, schools, and even within households. Gender segregation often reflects and reinforces traditional gender roles and stereotypes, which can limit equal access to resources, participation, and decision-making. It can occur through formal rules and informal practices and may contribute to ongoing gender inequalities by restricting interactions and opportunities between genders. For example, certain jobs or activities may be considered appropriate only for men or only for women because of this segregation. Overall, gender segregation highlights how societal norms shape and sometimes restrict the experiences of different genders. In Nepal, during menstruation, many girls and women are made to stay in separate rooms or are not allowed to enter the kitchen or temple. These practices come from traditional beliefs, but they can lead to unequal treatment between men and women.

Gender Discrimination

Gender discrimination means treating someone unfairly just because they are male or female. In Nepal, women are often paid less than men for doing the same work, especially in farming and construction. In many households, daughters are expected to do all the housework, while sons are not. Some women are also not allowed to make important family decisions or take part in community meetings. These types of unequal treatment are examples of gender discrimination and can stop people from living a fair and happy life.

Gender Stratification

Gender stratification means giving different levels of power, respect, and opportunity to men and women in a society. It happens when men are seen as more important or given more chances than women. In Nepal, for example, men are often given the role of family head, while women are expected to stay at home and do housework. Men usually have more chances to get higher education, good jobs, and take part in politics. Women, even if they work hard, may not get the same respect or pay as men. This unfair difference in status between men and women is called gender stratification.

6.2 Gender Equity and Gender Equality

Gender Equality

Gender equality means giving men and women the same rights, opportunities, and respect in all areas of life. It means both boys and girls can go to school, choose any job, and take part in decision-making. In Nepal, if a man can be a police officer, a woman should also have the same chance. If men can speak in public meetings, women should also be allowed to share their ideas. Gender equality also means that both men and women should help in housework and raising children. When everyone is treated equally, society becomes fair and strong.

Gender Equity

Gender equity means giving fair treatment to both men and women according to their needs. It does not always mean treating everyone exactly the same, but making sure everyone gets the support they need to succeed. For example, if a girl cannot go to school because she has to do housework, her family should help share the work so she can study too. In a workplace, if women are not getting the same pay as men for the same job, steps should be taken to fix that. In Nepal, programs that give special scholarships to girls or support women farmers are good examples of gender equity. The goal of gender equity is to make sure everyone, no matter their gender, has equal chances in life.

Difference Between Gender Equity and Gender Equality

Difference Between Gender Equity and Gender Equality

Gender Equality	Gender Equity
Gender equality is the term that describes a scenario where all genders are provided with equal access to resources, roles and opportunities without being biased.	Gender equity is the treatment of all genders considering all the circumstances to achieve outcomes.

Equality doesnot consider the differences among gender and treats all genders identically.	Equity considers the differences among genders and focuses on achieving the outcome.
Doesnot prioritise the outcome and is focused in providing equal resources and rights.	Prioritizes just outcomes.
It doesnot adress the systemic barriers caused by gender stratification.	Adresses systemic barriers.
Example: Company providing same salary and resources to their employees.	Example: Company provides women with special trafining programs to overcome hurdles in male dominated sectors, to address stratification's impact.

6.3 Identifying the Gender Needs and its Importance

Gender Needs

Gender needs are the specific needs and interests of men and women based on their roles, responsibilities, and experiences in society. These needs are different because men and women often live and work in different ways, especially in traditional communities like in Nepal. For example, women may need clean toilets and childcare services if they are working outside the home, while men may need safety training if they are working outside the home, while men may need safety training if they work in risky jobs. Understanding gender needs helps to make their fair plans and support both men and women properly.

Gender needs are the special requirements of all genders (practical and strategic needs) to achieve fair outcomes which may differ due to gender stratification.

Gender needs are categorized into two:

a. Practical Gender needs

Practical gender needs are the daily needs of men and women that come from

their current roles in society. These needs aim to improve living conditions without challenging traditional roles. For example, women in Nepal may need access to safe transportation, clean toilets at schools or workplaces, or flexible work hours to balance family and career responsibilities.

b. Strategic Gender Needs

Strategic gender needs are the needs that help to change unfair gender roles and bring long-term equality. These needs focus on giving women more power and control over their lives. For example, providing education to girls, equal pay for women, or involving women in decision making helps to challenge and improve their position in society.

Importance of Understanding Gender Needs

a. Helps to create fair and inclusive development programs for both men and women.

b. Supports women and men based on their daily roles and responsibilities.

c. Reduces the gap in education, health, and employment opportunities.

d. Encourages equal participation in decision-making at home and in the community.

e. Makes services like healthcare, sanitation, and training more effective and useful.

f. Promotes respect and understanding between genders.

g. Helps to remove barriers that stop women or men from improving their lives.

6.4 Role of Gender in Development

1. Ensures fair access to the rsources: Several drawback caused by gender stratification are ammended which allows all gender's access to the resources

2. Promotes non-discriminatory participation: Allows the partcipation of all gender in decision making and several development processess.

3. Empowers marginalized genders: The gender needs fulfillment empowers all the gender to meet their true potential.
4. Encourages sustainable development: Gender inclusive development encourages contributions from all genders improving economic,social and environmental outcomes.

6.5. Concept of WID, WAD and GAD

Women In Development

WID started in the 1970s as a response to the exclusion of women from development activities. At that time, People used to believe that only men are capable of doing important work regarding development and women were excluded from development programs. WID's goal was to change this by bringing women into development processes to improve the overall economy and society.

Women were considered essential contributors to the economy, but their contributions were often overlooked. WID aimed to involve women more in economic activities to raise their status.

Features of Women in Development

1. **Focuses on womens participation:** Women in development makes sure that women are involved in development projects, like farming or education programs.
2. **It helps in addressing womens specific needs:** WID focuses on what women needs to succeed like tools, training or rights. Helps in attaining practical and strategic needs.
3. **Challenging discrimination:** It fights for changes so that women can have the same power and opportunities as men.

Limitations

1. Women In Development focuses only on women, not all genders.
2. WID assumes women have same problems wheather rich or poor, living in urban areas or rural areas and so on.

3. WID focuses on practical needs and often outlook strategic needs.

Woman And Development

Woman and development is an approach where the existing contribution of women are acknowledged in work, farming, decision making which helps to solve the problems caused by gender stratification and achieve gender needs.

Features

1. Acknowledges women's role as they already contribute in farming, household and other activities.
2. Focuses on achieving fair outcome adressing the needs and resources.
3. Most of the women work in farming sector which is notable according to the concept of WAD.

Limitations

1. WAD focuses on big changes and neglects practical needs.
2. WAD focuses mostly on women not on all genders.
3. Faces barrier to changes
4. WAD needs huge amount of resources.

Gender And Development

The Gender and Development (GAD) concept is an approach that examines how social, economic, and cultural factors influence the roles, opportunities, and power relations between men and women. Rather than focusing solely on women, GAD looks at the relationships between all genders and seeks to identify and address structural inequalities that limit the potential of both women and men. It recognizes that gender roles are not biologically determined, but are socially constructed and shaped by history, culture, and power dynamics. The ultimate aim is to promote gender equality and empowerment by ensuring that both men and women participate equally in and benefit from development processes.

Features of GAD

1. GAD focuses on the socially constructed roles of men and women, not just

biological differences.

2. GAD addresses power relations and how they affect access to resources, opportunities, and decision-making.
3. It seeks gender equality through changes in laws, policies, and social norms.
4. It promotes participation, empowerment, and equity in all aspects of development.
5. It uses gender analysis to identify inequalities and design effective interventions.
6. It encourages active involvement of both men and women in tackling gender issues.
7. It recognizes that development should be sustainable, free from violence, and respectful of human rights.
8. It considers the impact of culture, class, age, ethnicity, and other social factors on gender relations.

Exercise

Choose the correct answer from the given alternatives.

1. What is the key difference between gender and sex?
   a. Gender is biological; sex is social
   b. Gender refers to identity shaped by society; sex is biological
   c. Sex refers to emotions; gender refers to profession
   d. Gender and sex mean the same in rural context
2. Which of the following best describes gender segregation?
   a. Unequal pay for men and women
   b. Hierarchical status of genders
   c. Division of roles and tasks based on gender
   d. Giving equal rights to all genders
3. Which example best illustrates gender equity?
   a. Paying all employees the same salary regardless of gender
   b. Assigning all genders the same roles in agriculture
   c. Providing special training programs for women in male-dominated sectors
   d. Prohibiting gender-based hiring in companies
4. Which of the following is NOT a feature of the Women In Development (WID) approach?
   a. Focus on women's participation
   b. Equal access to decision-making for all genders
   c. Providing tools and training for women
   d. Challenging gender-based discrimination
5. What does Gender And Development (GAD) primarily focus on?
   a. Only the needs of rural women
   b. Promoting women in agriculture

c. Relationship between genders and achieving equity

d. Providing practical needs like food and water

Write short answer to the following questions.

1. Define gender. List the gender roles traditionally practiced in the agricultural sector of rural Nepal.
2. What do you understand about gender needs? Explain the practical and strategic gender needs in brief.
3. Differentiate between gender equality and gender equity.
4. Explain the concept of Women in Development (WID) in brief. List its features.

Write long answer to the following questions.

1. Explain the role of gender in development and its importance in rural areas.
2. Compare and contrast the WID and GAD approaches. Highlight their strengths and limitations.
3. Discuss gender segregation and discrimination with examples. How do these impact rural development?

Introduction to computer

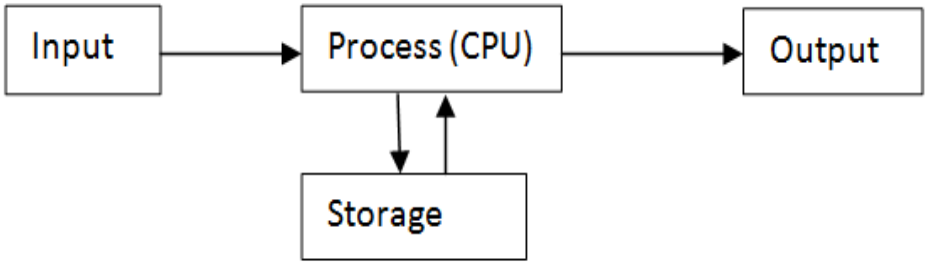
Unit 7

7.1. Concepts of computer

We all need to perform mathematical calculations in our day-to-day lives. When the calculations are simple, we feel easy and can perform the calculations accurately in a short time. But complex calculations take longer time and the accuracy is not always hundred percent. So man explored the idea of developing a machine that can perform mathematical calculations quickly and accurately. The computer was first introduced by the British mathematician Charles Babbage.

In this modern era, we can't think of living without a computer. It helps us perform many different tasks quickly, accurately, and in an organized way. It takes data and instructions from a user, processes them quickly, accurately, and in organized ways, and gives the information. A computer is a programmable electronic device that can transform or process data based on a set of instructions (i.e., program) and generate output (i.e., information). It helps us to save information for future use.

The computer consists of input, process, output, and store as IPOS. The block diagram of the IPOS cycle of the computer system as:



Input: The data is entered into the computer.

Process: The data is processed to produce information.

Output: Display information.

Storage: Store data and information

Computers in Agriculture

Computers play a big role in modern farming by helping farmers work faster, make better decisions, and increase crop production. Here are some ways computers are used in agriculture:

a. **Weather Prediction:** Farmers use computers to check weather forecasts, which helps them know the best time to plant, water, and harvest crops.

b. **Soil and Crop Management:** Special software helps farmers analyze soil quality, check plant health, and decide which fertilizers or pesticides to use.

c. **Smart Irrigation:** Computers control water supply systems, ensuring plants get just the right amount of water, reducing waste, and saving money.

d. **Livestock Management:** Farmers use computers to track animals' health, feeding, and growth to keep them healthy and productive.

e. **Farm Machinery:** Modern tractors and harvesters have GPS and computer systems that help farmers work more efficiently and cover large fields quickly.

f. **Market and Business:** Computers help farmers sell their products online,

check market prices, and keep records of expenses and profits.

7.2 History of Computer

The history of computers dates back to ancient times when people used tools like the abacus to perform basic calculations. In the 19th century, Charles Babbage designed the first mechanical computer, called the Analytical Engine, though it was never built during his lifetime. In the mid-20th century, computers evolved rapidly, starting with massive machines like ENIAC, which used vacuum tubes. The invention of transistors in the 1950s made computers smaller and faster. Later, integrated circuits and microprocessors revolutionized computing, leading to the personal computers of the 1980s and today's powerful, compact devices like laptops and smartphones. Over time, computers have transformed from simple calculators to essential tools for communication, work, and entertainment. A short description of the development process of the computer is described below:

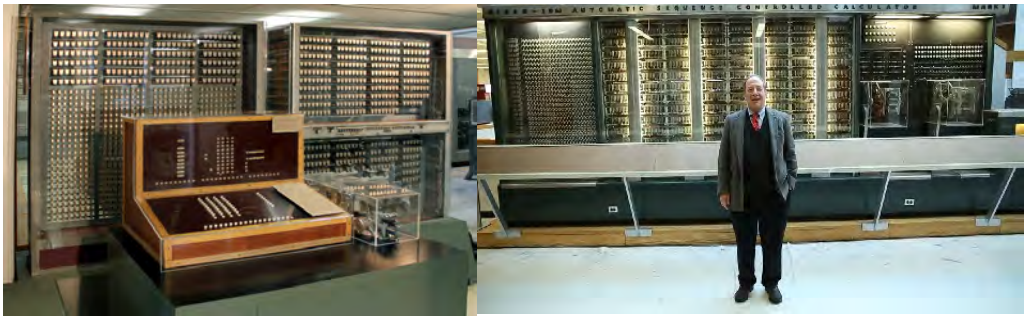
a. Mechanical Devices

The history of computers began with mechanical devices that aimed to simplify calculations and automate tasks. Early tools like the abacus (2400 BCE) were used for basic arithmetic, while the 17th-century Pascaline and Stepped Reckoner introduced mechanical computation for addition, subtraction, and more complex operations. In the nineteenth century, Charles Babbage created the Difference Engine and the Analytical Engine, which introduced concepts such as memory and conditional logic, providing the framework for contemporary computing. The Jacquard Loom demonstrated programmability through punch cards and Herman Hollerith's tabulating machine automated data processing for the U.S.

Census. These innovations bridged the gap between manual calculation and electronic computing, shaping the evolution of technology.

b. Electromechanical Computer (Devices)

The history of electromechanical computers marks a pivotal transition between mechanical and electronic computing. These devices used electrical components like relays and switches alongside mechanical parts to perform calculations and process data. The Zuse Z3 (1941), developed by Konrad Zuse, was the first programmable electromechanical computer, capable of solving complex equations. Another notable machine, the Harvard Mark I (1944), built by IBM, utilized punch cards and relays to automate calculations for military and scientific applications. Electromechanical computers were faster and more reliable than purely mechanical devices, and their programmability set the stage for fully electronic computers.



c. Electronic Computers (Devices)

The history of electronic computers began in the 1940s, marking a significant leap in speed, efficiency, and reliability over mechanical and electromechanical devices. These computers used vacuum tubes for electronic switching, enabling faster processing. The ENIAC (1945) was the first general-purpose electronic computer, capable of performing thousands of calculations per second, though it was massive and power-hungry. The arrival of transistors in the 1950s supplanted vacuum tubes, resulting in smaller, quicker, and more dependable second-generation computers. By the 1970s, the introduction of microprocessors had transformed computing, allowing for the creation of personal computers and

ushering in the contemporary age of electronic devices.

History of Computers in Nepal

Computers have not been around for very long in Nepal. Nepal hired many sorts of calculators and computers to conduct census calculations. The following list summarizes the history of Nepal. In the 2028 BS census, an IBM 1401 second-generation mainframe computer was used. In 2031 BS, a facility for Electronic Data Processing, later renamed the National Computer Facility (NCC), was constructed for national data processing and computer education. In 2038, the census was conducted using a second-generation mainframe computer, the BS ICL 2950/10. Nowadays, almost every institution, business organization, communication center, ticket counter, and so on uses computers.

After 2039 B.S., private enterprises and individuals in Nepal imported microcomputers such as Vector, IBM, and Apple. Nepal now has thousands of computer training colleges, as well as computer sales and repair facilities. Different universities are establishing IT colleges in Nepal. CDC and HSEB have added computer subjects to school and college curricula. The High-Level Commission for Information Technology (HLCIT) is a body established under the chairmanship of Nepal's Rt. Hon. Prime Minister to provide critical strategic direction and assist in the formulation of appropriate policy responses for the development of the ICT sector. The IT policy is also created in 2057 B.S.

IBM 1401 Computer

7.3 Capabilities and limitation of Computers

Characteristics of Computer

There are many electronic devices, but those devices do not have all the characteristics that a computer possesses. The following are the characteristics of a computer:

a) **Speed**

Computers can process and perform millions, or even billions, of calculations in just a second, which is much faster than any human can achieve. This speed allows them to handle complex tasks like running programs, analyzing large amounts of data, and performing multiple tasks at the same time without delays. The speed of a computer depends on factors like its processor, memory, and the technology used, making them essential for tasks that require quick and accurate results. The table below shows the speed of the computer in different units of time.

Unit of Time	Part of Second	Power of 10	
Millisecond (ms)	1/1000	10^{-3}	One Thousandth
Microsecond (µs)	1/1000000	10^{-6}	One Millionth

Nanosecond (ns)	1/1000000000	10^{-9}	One Billionth
Picosecond (ps)	1/1000000000000	10^{-12}	One Trillionth
Femtosecond (fs)	1/1000000000000000	10^{-15}	One Quadrillionth

b) Accuracy

Another important characteristic of computers is their accuracy. Computers perform tasks and calculations exactly as they are programmed, without making mistakes, as long as the instructions and data provided are correct. Unlike humans, they don't get tired or distracted, so they can work with consistent precision. This accuracy makes them reliable for activities like solving complex math problems, processing large datasets, or running critical systems like those in healthcare or banking. The incorrect output produced due to incorrect input is called Garbage in Garbage out (GIGO). An error due to the malfunctioning of hardware or programs is referred to as a bug.

c) Automatic

Computers are automatic, meaning they can perform tasks on their own once they are programmed and started. They don't need constant human involvement to carry out instructions. For example, when you run a program, the computer automatically follows the steps in the program without needing help at each stage. This feature allows computers to handle repetitive or complex tasks efficiently, making them useful for things like controlling machines, running software, or automating processes in industries.

d) Storage

One of the important characteristics of computers is their ability to store large amounts of data. Computers can save information, such as documents, images, videos, and software, in their memory for future use. This storage can be temporary (like RAM) or permanent (like hard drives, SSDs, or cloud storage). The stored data can be accessed quickly and accurately whenever needed. Computers also allow users to organize and retrieve data easily, making them essential for tasks like managing records, creating backups, and running applications that require

large amounts of information.

e) **Diligence**

Computers are diligent, meaning they can work continuously without getting tired or losing efficiency. Unlike humans, they don't need breaks, rest, or sleep, and they don't make mistakes due to fatigue. This makes computers ideal for performing repetitive tasks, such as data entry, calculations, or running programs for long periods. They can maintain the same level of performance and accuracy no matter how long they work, which is why they are used in industries that require constant and reliable operations, like banking, manufacturing, and research.

f) Versatility

Computers are highly versatile, meaning they can perform many different tasks depending on the software or program being used. For example, they can help with writing documents, editing videos, designing graphics, browsing the Internet, or even controlling machines. This versatility comes from their ability to switch between tasks quickly and adapt to new instructions without needing physical changes. Whether it's for personal use, education, business, or scientific research, computers can handle a wide range of activities, making them incredibly useful in almost every field.

Limitation of Computers

There are some limitations of the computer systems depending on their ability, dependency, actions, and many more. The main limitations of the computer are as follows:

- Lack of Thinking Ability: Computers cannot think or make decisions on their own; they only follow instructions given by humans.
- No Creativity: Computers cannot create new ideas, innovate, or think outside the box like humans can.
- Dependence on Human Input: They rely on accurate data and instructions from humans; incorrect input leads to errors.

- No Emotional Understanding: Computers cannot understand emotions, empathy, or human feelings.
- Limited by Programming: A computer can only perform tasks it has been programmed to do and cannot go beyond its code.
- Susceptible to Viruses and Malware: Computers can be infected by malicious software, which can cause them to malfunction.
- High Energy Consumption: Operating computers and related devices require electricity, which can be costly.
- Need for Maintenance: Computers require regular updates, repairs, and maintenance to function efficiently.
- Data Security Risks: Without proper security, computers are vulnerable to hacking, data breaches, and unauthorized access.
- No Adaptability to Changing Environments: Computers cannot adjust to new situations without reprogramming or external modifications.

7.4 Types of computers (Data: Analog, Digital, Hybrid); (Size: Micro, Mini, Mainframe and Super)

Different types of computers are used in different areas. Computers used at offices, homes, hospitals, and research centers may be different. They may differ in size, tasks, purpose, model, and brand. Computers can be classified based on size, data handling capability, purpose, model, and brand.

On the basis of data handling

On the basis of data handling, computers are classified into three categories:

a. Analog Computer

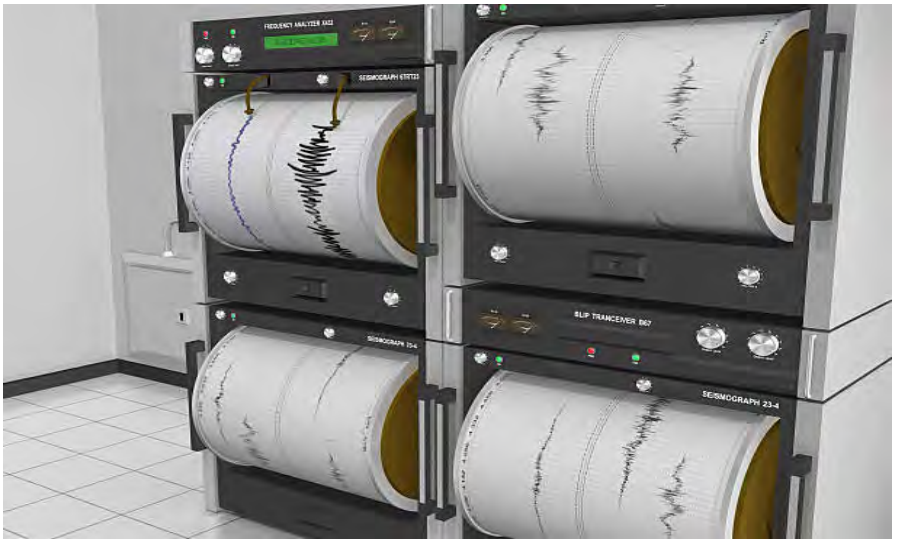
b. Digital Computer

c. Hybrid Computer

a. Analog Computer

Analog computers are special-purpose computers (i.e., dedicated to a single

task) that can measure continuous physical values like length, temperature, pressure, speed, height, vibration, etc., and convert them to numeric values. All operations on the analog computer are performed in parallel. Speedometers and thermometers are examples of analog devices. The speedometer shows the speed of the vehicle while it is moving. Analog computers are used for scientific and engineering purposes. Industries like power plants, petroleum refineries, and chemical plants use these computers. A seismograph is an example of an analog computer that measures an earthquake. In the ICU (Intensive Care Unit) of a hospital, the heartbeat, blood pressure, pulse, etc. of patients are monitored by analog computers.



Analog Computer – Seismograph

b. Digital Computer

Digital computers are general-purpose computers that work on binary digits. They accept discrete data (discontinuous data) like letters, numbers, symbols, and figures, and these data are represented in terms of binary numbers. Digital computers can't measure temperature, pressure, voltage, etc. Digital computers accept data and instructions, process them, and give the information. Almost all the computers that we use in offices and homes are digital.

c. Hybrid Computer

A hybrid computer has the capabilities of both analog and digital computers. It is a special-purpose computer. It accepts a continuously varying input which is then converted into discrete data for digital processing. They are used in air-planes, ships, factories, hospitals, and research centers. CT-Scan machines, ECG machines, and Ultra sound machines are examples of hybrid computers used in the health sector. Pathfinder is the hybrid computer that was sent to Mars.

On the basis of size

On the basis of size, computers are classified into four categories. They are:

a. Microcomputer

b. Minicomputer

c. Mainframe computer

d. Supercomputer

a. Microcomputer

A microcomputer is a single-user general-purpose computer that is smaller than a minicomputer. It consists of a microprocessor as the main component. It is also called a personal computer (PC). Microcomputers are commonly

used in homes, schools, banks, offices, etc. Microcomputers are available in various sizes like desktops, laptops, and palmtops. A desktop computer is larger than a laptop and a palmtop and is required to be kept on the desk or table for use. Laptops and palmtops (or personal digital assistants, i.e., PDA) are small and compact. They are portable and can be taken from one place to another very easily. While using them, they can be kept on the lap and the palm. A laptop computer can be kept on a lap for working. A laptop computer is also called a notebook computer. A palmtop can be kept on the palm while using. These portable computers have a backup power supply facility, so they can be used in places where there is no electricity. Dell, Apple, IBM, Sony, Toshiba, and Acer are some of the leading manufacturers of laptop computers.

b. Minicomputer

A minicomputer is larger than a microcomputer. It is smaller than a mainframe and a supercomputer. A minicomputer is a mid-range server computer that consists of two or more processors. A minicomputer has more storage capacity and higher processing speed than a microcomputer. A minicomputer is a multi-user computer that provides facilities to operate 100 people simultaneously via terminals (A terminal is a device through a keyboard, mouse, monitor, and other devices are connected to a computer). Nowadays, minicomputers are mostly used as servers in the computer network. They are used for data processing, desktop publishing, etc.

c. Mainframe Computer

A mainframe computer is a multi-user computer having faster processing speed and more storage capacity than a minicomputer. They are larger than minicomputers. They can support thousands of users through the terminals. Big organizations use mainframe computers for bulk data processing, financial transaction processing, etc. They are also used as central host computers in distributed data processing systems. IBM zSeries, FUJITSU Server GS21, Cray XE6, Tianhe-1A, etc. are examples of Mainframe computers.

d. Supercomputer

Supercomputers are extremely powerful computers that can perform a huge number of calculations very quickly. They are designed to solve complex problems that require enormous amounts of processing power, such as predicting weather patterns, designing new drugs, or simulating nuclear reactions. Unlike regular computers, supercomputers have many processors working together at the same time, making them much faster and more capable. They are used by scientists, researchers, and governments for tasks that demand high-speed computing, like space exploration or climate modeling. Supercomputers are very expensive and need special cooling systems because they generate a lot of heat. The world's most powerful supercomputer is El Capitan, developed by Hewlett Packard Enterprise (HPE) for the U.S. Department of Energy's Lawrence

Livermore National Laboratory. In our country, Nepal, computer engineer, Muni Bahadur Sakya constructed a supercomputer in 2063 B.S. by joining sixteen microcomputers.

Supercomputer

7.5 Generations of Computers and their Features

The generations of computers refer to the major advancements in technology that have shaped the development of computers over time. The first generation (1940s-1950s) used large vacuum tubes and was very slow. The second generation (1950s-1960s) replaced vacuum tubes with transistors, making computers smaller, faster, and more reliable. The third generation (1960s-1970s) introduced integrated circuits, allowing computers to become even more compact and efficient. The fourth generation (1970s-present) saw the development of microprocessors, which made personal computers possible. The fifth generation (ongoing) is focused on artificial intelligence and advanced computing technologies like quantum computing, aiming to make computers even more powerful and intelligent. Following are the main five generations of computers.

Generation	**Time**	**Main Component**
First Generation	1945 to 1955	Vacuum tube

Second Generation	1956 to 1964	Transistors
Third Generation	1965 to 1971	Integrated Circuits
Fourth Generation	1972 to 1980	Micro Processor
Fifth Generation	1981 to present	Bio Chip

First Generation (1945 to 1955)

- The computers utilized vacuum tubes for circuitry and magnetic drums for memory.
- They were massive, expensive, and unreliable, generating significant heat.
- ENIAC (1945), the first general-purpose computer, could perform thousands of calculations per second.
- Programming was done using machine language.

Second Generation (1956 to 1964)

- Transistors replaced vacuum tubes, making computers smaller, faster, and more reliable.
- COBOL and FORTRAN, the first high-level programming languages, were created.
- Computers like the IBM 1401 became popular in businesses for data processing.

Third Generation (1965 to 1971)

- The introduction of integrated circuits (ICs) revolutionized computer design by combining multiple transistors on a single chip.
- Computers became smaller, cheaper, and more efficient, leading to wider adoption in industries.
- Operating systems were introduced, allowing multiple programs to run simultaneously.

Fourth Generation (1972 to 1980)

- Microprocessors are a single chip that houses the whole CPU.
- Personal computers, such as the Apple II (1977) and IBM PC (1981), made computing more accessible to individuals.
- The rise of software applications, graphical user interfaces (GUIs), and networking (e.g., the Internet) further expanded usage.

Fifth Generation (1981 and Beyond)

- Focused on artificial intelligence (AI), machine learning, and quantum computing.
- Modern computers are incredibly fast, compact, and energy-efficient, capable of processing complex tasks like natural language processing and big data analysis.
- Examples include AI-driven systems, advanced robotics, and cloud computing platforms.

Exercise

Choose the correct answer from the given alternatives.

1. Which is not the characteristic of a computer?

   a. Speed b. Accuracy

   c. Storage d. Intelligence

2. What is the incorrect result due to incorrect input?

   a. GIGO b. FIFO c. LIFO d. GOGO

3. Which of the following is related to the capability to perform tasks repeatedly.

   a. Versatility b. Reliability c. Diligence d. Intelligence

4. Which computer is capable of processing analog and digital computer?

   a. Hybrid b. Hyper c. Analog d. Digital

5. How many kilobytes are in one megabyte?

   a. 1030 b. 1000 c. 1048 d. 1024

Write short answer to the following questions.

1. List the characteristics of a computer.
2. Why is a computer called diligent machine?
3. Why is a computer called versatile machine?
4. Write the difference between desktop and laptop computers.
5. Write the difference between analog and hybrid computers.

Write long answer to the following questions.

1. Classify computers on the basis of their size and explain them in brief.
2. Classify the types of digital computers with short description.
3. Classify the computers on the basis of brand and explain them in brief.
4. Classify the computers on the basis of data handling and explain them in brief.

Project Work

1. Draw 'Computer and its parts' on chart paper and demonstrate.
2. Make presentation on the 'Features of computer'.
3. Draw 'Types of computers on the basis of working principle' on chart paper and paste in your class room.
4. Prepare a presentation about use and purpose of hybrid and supercomputer in different sector and demonstrate.

Computer System

Unit 8

8.1 Familiar with all Hardware Parts with CPU of Computer and Dismantle

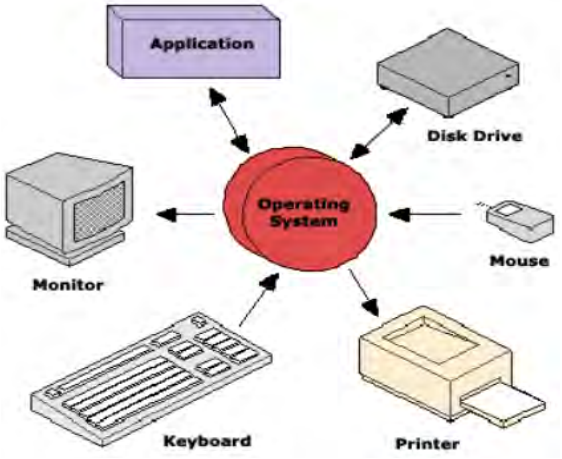
The hardware parts of a computer work together to help it function. The CPU (Central Processing Unit) is the brain of the computer, responsible for processing instructions and performing calculations. Around the CPU, you'll find RAM (Random Access Memory), which temporarily stores data the CPU is actively using. The hard drive or SSD (Solid State Drive) stores all your files and software permanently. Other parts include the motherboard, which connects all the components, and power supply unit (PSU), which provides electrical power. The graphics card handles images and video display, while the cooling system (like fans or liquid cooling) keeps the CPU and other parts from overheating. When you dismantle a computer, you would carefully remove these components from their slots or connections, taking care not to damage any parts, especially the CPU and motherboard.

Computer Hardware in Agriculture

Computer hardware, like sensors, GPS devices, and drones, helps make farming easier and more efficient. Sensors placed in the soil check moisture levels, temperature, and nutrients, helping farmers know when to water or add fertilizers. GPS technology in tractors helps with precise planting and harvesting, saving time and reducing waste. Drones with cameras take pictures of fields to monitor crop health and detect problems like pests or diseases. Weather stations with computer hardware collect data to predict rainfall and climate changes. With these tools, farmers can grow more crops with less effort and make better decisions for a successful harvest.

8.2 Basic Components of a Computer System (Input, Output, Processor and Storage)

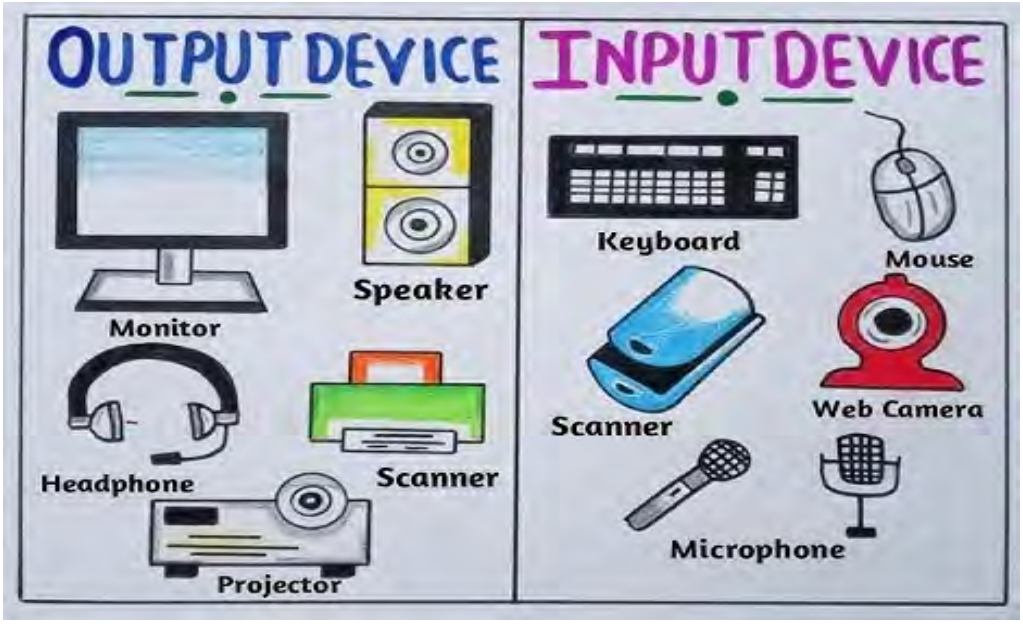
The components of a computer are classified into four units. They are the input unit, the output unit, the memory unit, and the processing unit.



Input Unit

A computer requires data and instructions to produce useful information. To enter data or instructions into a computer, input units are used. Input units are the

components of a computer through which data or instructions are entered into the computer. It is the medium through which a user communicate with the computer. An input unit is also called an input device. A computer may have more than one input unit. Keyboard, mouse, joystick, touch screen, touchpad, scanner, digital camera, etc. are input units. When you enter data or instructions using input units, they convert the input data or instructions into computer-understandable form, i.e., binary form, and pass the binary form data or instructions to the computer for further processing.



Output Unit

A computer user needs to see input data and instructions through the input devices. A computer needs to present or display information being processed on it to a user. An output unit is used to display or present data, instructions, or information to the user. An output unit is the component of a computer that displays or presents data, information, etc. to the user in human-understandable language. An output unit is also called an output device. Monitor, printer, speaker, plotter, projector, etc., are the output devices.

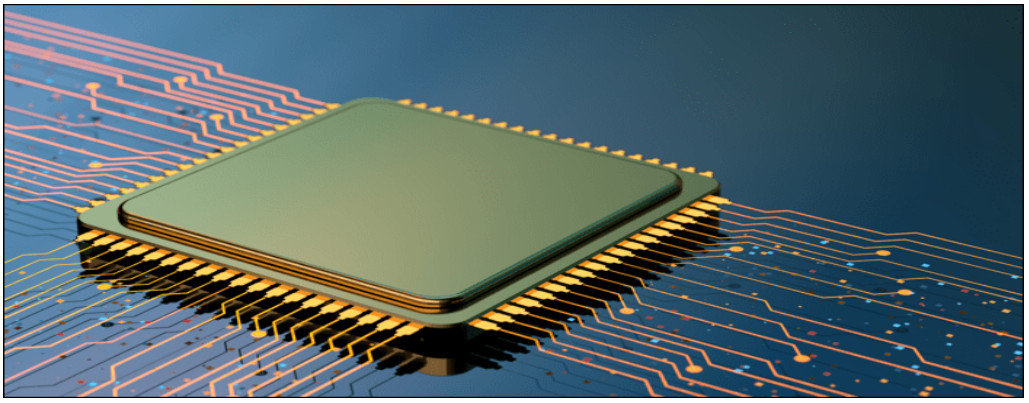
Output devices are categorized into:

a) Softcopy Output Device

b) Hardcopy Output Device

Proccessing Unit

The Processing Unit, or Central Processing Unit (CPU), is the brain of the computer. It carries out all the instructions that the computer needs to perform tasks, such as calculations, logic operations, and controlling other parts of the computer. When you run a program, the CPU processes the data and tells the rest of the system what to do. It works by fetching instructions from the computer's memory, processing them, and then storing the results. The CPU's speed, measured in gigahertz (GHz), determines how quickly it can perform these tasks. It's a crucial part of the computer.



Concept of Memory Unit

The Memory Unit of a computer is where it stores data and instructions that are needed for processing. It works like a storage space that helps the CPU quickly access information to perform tasks. There are two main types of memory: Primary Memory (like RAM, which is temporary and fast) and Secondary Memory (like hard drives or SSDs, which store data permanently). The Primary Memory holds data that the CPU needs right away, while Secondary Memory is used for long-term storage of files and programs.

The memory unit helps ensure that the CPU can work efficiently without delay by providing quick access to the data it needs.

8.3 Memory (Primary and secondary, RAM, ROM)

In a computer system, when you give it data and instructions to work with, it needs a place to keep them temporarily while it works on them. This temporary storage space is called primary memory and includes things like cache, RAM, and registers. Once the computer processes the raw data, it turns it into useful information. This useful information needs to be kept for later use, so we use storage devices like hard disks, solid-state discs, pen drives, etc., to store it. A storage device that stores data, instructions, etc., permanently is known as secondary memory. Primary memory is where data and information are stored temporarily, while secondary memory is where they're kept for a longer time.

Memory is made up of many tiny cells, each capable of holding a bit of information. These cells are organized into groups called words, which have addresses assigned to them. When the computer needs to work with data or instructions, it uses these addresses to find them in memory. The speed at which the computer can find these addresses affects the cost of the memory i.e., if it's faster, it's usually more expensive.

Memory is the storage location where we can store data and information, either temporarily or permanently. The units of measurement of memory in a computer are bits, KB, MB, GB, etc. The storage unit of data and information on a computer is as:

Unit	Measurement
0,1	Bits
4 bits	1 Nibble
8 bits	1 Byte
1024 Byte	1 KB
1024 KB	1 MB (Mega Byte)

1024 MB	1 GB (Giga Byte)
1024 GB	1 TB (Tera Byte)
1024 TB	1 PB (Peta Byte)

Types of Memory

A computer memory is used for storing various types of data and information. There are different types of memory for storing data and information. Some memory stores data temporarily and some stores permanently. Some memories communicate directly with CPU where as some communicate indirectly with computer system. The overall classification of computers can be done in two types:

a. Primary Memory and
b. Secondary Memory

Primary/Main Memory

Primary memory, also known as the main memory or internal memory of a computer system, serves as the core storage component. It can be categorized as either temporary or permanent. Compared to secondary memory, primary memory has a relatively limited storage capacity. Its primary function is to temporarily store data and instructions during processing. Acting as the memory directly accessible by the CPU, primary memory facilitates the processor's interaction with running applications and services stored temporarily in specific memory locations. Upon booting up, primary memory loads all active applications, including the operating system, user interface, and background programs. Whenever a program or application initiates within the computer system, it is loaded into primary memory to interact with the operating system. Common types of primary memory include RAM, ROM, cache memory, and virtual memory.

Characteristics of Main/Primary Memory

The following are the major characteristics of primary memory:

i. It is an internal memory.

ii. It is more expensive than secondary memory.

iii. It is faster than secondary memory.

iv. Primary memory can directly communicate with the CPU.

v. Primary memory can be temporary or permanent.

vi. Its storage capacity is limited.

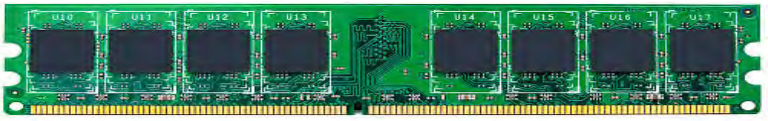
vii. Primary memory generally loads currently running applications.

Types of Primary/Main Memory

The basic two types of primary memories are: RAM and ROM.

a. Random Access Memory (RAM)

Random Access Memory (RAM) is a type of computer memory that temporarily stores data and programs that the CPU is currently using. It allows the CPU to quickly access the information it needs to perform tasks. RAM is much faster than other types of storage, like hard drives or SSDs, but the data is lost when the computer is turned off. The more RAM a computer has, the more tasks and programs it can handle at once without slowing down. It's like a short-term workspace where the computer keeps important information while it's running.

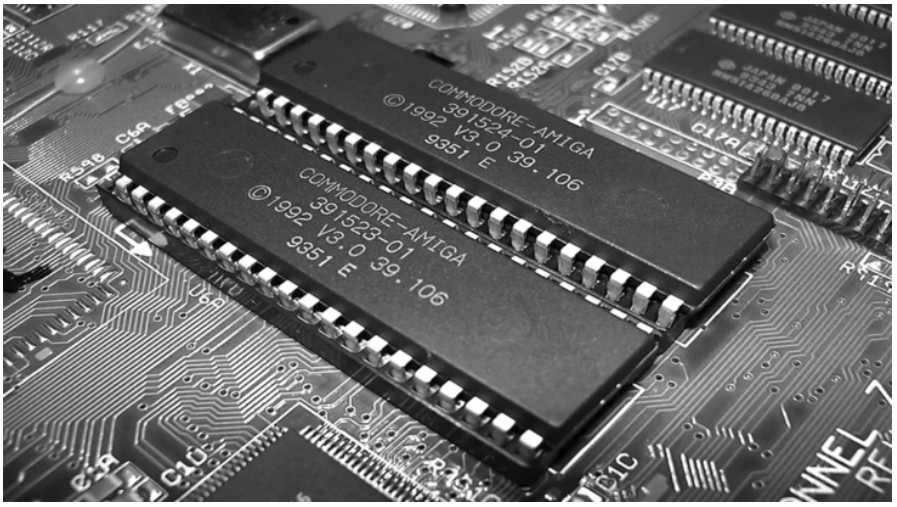


Random Access Memory

b. Read-Only Memory (ROM)

Read-Only Memory (ROM) is a type of memory in a computer that stores important data permanently. Unlike RAM, the data in ROM is not lost when the computer is turned off. It contains the basic instructions needed to start the computer, like the BIOS (Basic Input/Output System), which helps the computer boot up. ROM is called "read-only" because the data is usually only read and not changed or erased. This makes it reliable for storing essential information that the computer needs to function properly. Variants of ROM include PROM,

EPROM, and EEPROM.



Read Only Memory

Difference between RAM and ROM

Random Access Memory	Read Only Memory
a. It is the volatile memory of computer system.	a. It is the non-volatile memory of computer system
b. Currently using data and instructions are stored in RAM.	b. BIOS data and instructions are stored in ROM.
c. The content of ROM gets erased when the power supply is turned off.	c. The content of ROM doesn't gets erased when the power supply is turned off.
d. Programs and files in RAM are loaded when the computer starts booting.	d. Program in ROM are stored during the time of manufacturing.
e. RAM has high storage capacity.	e. ROM has less storage capacity.
f. RAM is expensive.	f. ROM is less expensive.

8.4 Storage devices: Magnetic tape, magnetic disks: Hard disk and floppy disks (Winchester disk), Optical disks: CD, VCD, CD-R, CD-RW, DVD, DVD-RW, Blue Ray Disc, Flash drives, SD/MMC memory cards

Secondary Memory

Secondary Memory is the type of storage in a computer where data is kept permanently or for long-term use. Unlike RAM, which is temporary and gets erased when the computer is turned off, secondary memory stores your files, programs, and other important data even after the computer is powered down. Examples of secondary memory include hard drives (HDD), solid-state drives (SSD), and optical disks (like CDs and DVDs). Secondary memory provides a much larger storage capacity than RAM and is essential for keeping everything safe and accessible over time.

Characteristics of Secondary Memory

i. It is cheaper than primary memory.

ii. It can store larger volume of data than primary memory.

iii. It is also called backup memory.

iv. It is a permanent memory.

v. It is also often called auxiliary memory.

4.5.2. Types of Secondary Memory

a. Magnetic Storage Devices

Magnetic storage devices store data using a magnetic layer on their surface. This layer can be magnetized in different directions to represent binary 1s and 0s. When the disk spins, a reader interprets the stored data. The surfaces of these devices are coated with materials like iron oxide, which can be magnetized to store data in binary form. Magnetic storage devices offer large data capacities at reasonable prices.

i. **Magnetic Tapes:** Magnetic tapes were the traditional types of storage devices where data were accessed in sequential order. These tapes were

normally used for analog audio recordings. And early computer used these tapes to store the digital data.

ii. **Floppy Disk:** A floppy disk consists of a flexible disk coated with magnetic material, encased in a protective plastic covering. Once a prevalent form of portable storage, they could hold up to 1.44 MB of data. However, they are now obsolete due to their limited storage capacity and reduced portability. To access data on a floppy disk, a Floppy Disk Drive (FDD) is required for reading and writing. IBM pioneered the creation of the first floppy disk. Floppy disks come in various sizes, with the disk's physical dimensions determined by its inch size.

iii. **Hard Disk :** A hard disk (also called a hard drive) is a type of secondary memory in a computer where data is stored permanently. It is used to save files, programs, and the operating system. The hard disk has a spinning disk inside that stores data using tiny magnetic areas, and a read/write head moves over the disk to access or save information. Though it is slower than RAM, the hard disk offers a much larger storage capacity and keeps your data safe even when the computer is turned off. Nowadays, many computers use solid-state drives (SSDs), which are faster and have no moving parts, but hard disks are still commonly used for large storage needs.

iv. **Flash Memory (Pen Drive) :** Flash memory is a type of storage that is faster than traditional hard disks and doesn't have any moving parts, making it more durable. It stores data electronically, using special cells that retain information even when the power is turned off. Flash memory is commonly used in devices like USB drives, memory cards, solid-state drives (SSDs), and even smartphones. It's small, portable, and reliable, making it a popular choice for saving data that needs to be accessed quickly and easily, such as photos, videos, and apps. Because it's faster and more durable than older types of storage, flash memory has become widely used in modern electronics.

v. **SD/MMC Memory Cards :** SD (Secure Digital) and MMC (Multi Media Card) memory cards are small, portable storage devices used to save data like photos, videos, and files. They work like tiny hard drives for gadgets such as cameras, smartphones, and tablets. SD cards come in different sizes (like standard, mini, and micro) and capacities, while MMC cards are an older, similar type of card but less commonly used today. Both are inserted into compatible slots on devices, making it easy to transfer or store data. They're popular because they're lightweight, reusable, and convenient for expanding a device's storage.

b. Optical Storage

Optical storage is a type of data storage that uses light to read and write information. The most common examples are CDs (Compact Discs), DVDs (Digital Versatile Discs), and Blu-ray discs. Data is stored on these discs as tiny pits and bumps on the surface, which are read by a laser. Optical storage is mostly used for things like music, movies, and software distribution.

i. CD-ROM: Compact Disk Read-Only Memory (CD-ROM) is a type of optical storage used to store data that can only be read, not written to or changed. A CD-ROM looks like a regular CD, but it contains information such as software, music, or other data that is permanently stored. The data on a CD-ROM is read by a laser inside a computer's CD drive. Unlike regular CDs, which you can burn data onto, a CD-ROM comes pre-recorded with information and cannot be altered. It was commonly used in the past for distributing software and media, though it has been largely replaced by newer technologies like DVDs and downloads.

ii. VCD (Video Compact Disc): VCD is a digital format used to store and play videos, similar to a DVD but with lower quality. It was popular before DVDs and streaming services became common. VCDs can hold about 60–80 minutes of video and are played using VCD players, DVD players, or computers. They use the MPEG-1 video format and are often used for movies, educational videos, and presentations. While VCDs are now less

common, they were an important step in the development of digital video storage and multimedia learning.

iii. CD-RW: Compact Disk Rewritable (CD-RW) is a type of optical disk that allows you to write and rewrite data on it multiple times. Unlike a regular CD-ROM, which can only store data that can be read, a CD-RW can be erased and re-recorded with new information, just like a hard drive or flash memory. This makes it useful for tasks like backing up files, transferring data, or testing software. However, CD-RWs have a limited number of times they can be rewritten before the quality of the disk starts to degrade. While it was once popular for data storage and sharing, CD-RWs are now less commonly used, with other storage options like USB drives and cloud storage taking their place.

iv. DVD ROM: Digital Versatile Disk Read-Only Memory (DVD-ROM) is a type of optical disk used to store large amounts of data that can only be read, not changed or written over. A DVD-ROM is similar to a CD-ROM but can hold much more data, making it ideal for storing movies, software, or large files. The data on a DVD-ROM is read by a laser in the DVD drive, and because it has more storage capacity than a CD-ROM, it became widely used for things like video discs and software distribution. Unlike a CD-RW, you cannot erase or rewrite data on a DVD-ROM; it's permanently recorded when it's made.

v. Blu-ray Disk: Blu-ray Discs are a type of optical storage that can hold much more data than regular DVDs and CDs. They are commonly used for storing high-definition (HD) movies, games, and large files because they can store up to 25 GB of data on a single layer, and even more on double-layer discs. Blu-ray uses a blue laser (instead of the red laser used by DVDs) to read and write data, which allows it to store more information in the same amount of space. While Blu-ray discs are mainly used for movies and games, they are also used for data storage and backup due to their large capacity.

Difference between Primary and Secondary Memories

Primary Memory	Secondary Memory
a. Primary Memory is considered as main memory of computer system.	a. Secondary memory is also known as auxiliary or backup memory.
b. It can directly communicate with CPU.	b. Secondary memory indirectly communicate with CPU.
c. The storage capacity of primary memory is less than secondary memory.	c. The storage capacity of secondary memory is high than primary memory.
d. Primary memory is faster than secondary memory.	d. Secondary memory are slower than primary memory.
e. They are more expensive.	e. They are less expensive
f. Information stored in primary memory cannot be moved from one place to another.	f. Information stored in secondary memory can be transferred from one computer to another.
g. Data and instructions to be currently executed are stored in Primary memory.	g. Data and information to be stored permanently are kept in secondary memory.
h. Primary memory can be both volatile and non-volatile.	h. Secondary memory are non-volatile in nature.
i. Primary Memory has faster access time.	i. This memory has low access time.
j. Examples: RAM, ROM, Cache	j. Examples: Pen drive, CD, Hard Disk.

Exercise

Choose the correct answer from the given alternatives.

1. Which of the following is secondary storage device?

   a. Hard Disk b. Pen drive

   c. CD d. All of the above

2. Which of the following is non-volatile memory?

   a. ROM b. RAM c. Cache d. Register

3. Which of the following is the fastest memory of computer?

   a. Hard Disk b. RAM c. Cache d. Register

4. What is the main difference between RAM and ROM?

   a. RAM is internal and ROM is external memory

   b. RAM is non-volatile and ROM is volatile.

   c. RAM is volatile and ROM is non-volatile.

   d. RAM is external and ROM is internal.

5. Which of the following is another name of secondary memory?

   a. temporary b. Internal

   c. Auxiliary d. All of the above

6. Which of the following is high speed memory between RAM and CPU?

   a. Register b. Cache

   c. Hard Disk d. All of the above

7. Which of the following is Optical Storage Device?

   a. CD b. DVD

   c. BDI d. All of the above.

8. Choose the sequential storage.....

a. Magnetic Tape b. Hard Disk

c. RAM d. ROM

9. Which of the following required periodic refreshment?

a. SRAM b. DRAM

c. Both i and ii d. None of the above.

10. Which of the following uses electrical charges to erase the content?

a. EPROM b. EEPROM

c. PROM d. None of the above

Write short answer to the following questions.

1. Define RAM.
2. Define computer memory.
3. Give some examples of Primary Memory.
4. Define ROM? List its types.
5. What is magnetic storage device?
6. What is optical storage?
7. Define Blu-ray Disk.
8. What is primary memory?

Write long answer to the following questions.

1. Define computer memory. Why it is necessary in computer system?
2. What is primary memory? Lists its features.
3. Define secondary memory? List its features.
4. List different types of memory.
5. What is RAM? List its characteristics.
6. What is ROM? Discuss its features.

7. List the characteristics of primary memory.
8. List the characteristics of secondary memory.
9. Differentiate between primary and secondary memory.
10. Why is a hard disk called as a permanent memory?
11. Why is RAM known as a volatile memory?
12. Write short notes on:

    a. Hard Disk b. SSD c. Optical Storage

    d. Blu-ray disk e. Flash Memory

Project Work

1. Describe computer memory and its main types by using PowerPoint presentation and demonstrate.
2. Prepare a presentation about "HDD and SSD" and demonstrate.
3. Prepare a presentation about different storage hardware found in the computer lab and demonstrate.
4. Draw a chart paper about different types of computer memory with your name and paste it into your classroom.
5. Visit the IT solution office such as the computer maintenance center and sales, and collect the latest available memory devices.

Operating System

Unit 9

9.1 Introduction of Operating System

An operating system (OS) is software that manages all the hardware and software on a computer or device. It acts as a bridge between the user and the computer's hardware, making it easier to interact with the system. The OS controls tasks like running programs, saving files, and managing memory. Popular examples of operating systems include Windows (used in many personal computers), macOS (for Apple computers), Android (for smartphones), and iOS (for iPhones). Each OS helps devices run smoothly and efficiently, ensuring everything works together seamlessly.

Functions and Characteristics of Operating System

An operating system (OS) performs several key functions to help a computer or device run smoothly. It manages the computer’s hardware, like the CPU, memory, and storage, making sure everything works together efficiently. The OS also controls and runs software programs, allowing users to interact with them. It provides a way to organize files and folders, handles input from devices like keyboards and mice, and controls output to screens and printers. Additionally, it ensures that different programs and users can run at the same time without interfering with each other, and it keeps the system secure by managing access to files and resources.

The main characteristics of an operating system (OS) include multitasking, which allows it to run multiple programs at once, and memory management, which ensures the system uses memory efficiently. It also provides user interface, such as graphical (like icons and windows) or command-line, for easy interaction with the system. File management is another key feature, helping to organize

and access files. The OS handles security by protecting data and controlling who can access certain information. Additionally, it manages hardware resources (like the CPU, storage, and input/output devices) and ensures they work together smoothly.

9.2 Windows Operating System, Introduction to GUI and its Feature Working with a Window Environment and Window Application Program

The user interface is how a user interacts with a computer. There are two types of user interfaces: graphic user interface (GUI) and character user interface (CUI). The GUI is a form of interface that allows a user to interact with a computer by selecting graphics. Graphics include icons, navigation bars, photos, and other elements that display on the desktop. In the GUI, a mouse can be used to select icons or commands. To do tasks using this GUI, a user does not need to recall commands. Graphics allow users to easily pick and type commands. The interface is highly user-friendly. All Windows-based operating systems are graphical user interfaces.

The CUI (also known as CLI, or command line interface) is a text-based user interface in which a user interacts with a computer by typing textual commands via a keyboard. To carry out any activity, a command is necessary. To apply the instructions, the user must remember all of their syntaxes.

Character User Interface

Graphic User Interface

The interface categorizes operating systems into two kinds.

a. CLI-based operating system

In a CLI-based operating system, users must type commands to complete any task. MS-DOS and Novell Netware are CLI-based operating systems.

b. Graphical User Interface (GUI)-Based Operating System

Icons, buttons, dialog boxes, and other tools are available in GUI-based operating systems to allow users to interact with computers. Windows operating systems, such as Windows 95, Windows XP, and Windows Vista, use a graphical user interface.

9.3 Introduction to Open Sources Operating System with Examples

An open-source operating system is one where the source code, or the program's instructions, is freely available for anyone to view, modify, and distribute. This allows developers and users to make improvements or customize the OS to fit their needs. Open-source operating systems are typically free to use, which makes them popular in both personal and professional settings. A well-known example is Linux, which comes in many different versions (like Ubuntu and Fedora). Other examples include FreeBSD and Android (which is based on open-source Linux). Open-source systems encourage collaboration and innovation, offering flexibility and transparency.

Mobile Apps in Agriculture

Mobile apps help farmers make smart decisions by providing important farming information at their fingertips. Weather apps warn about rain, storms, or drought so farmers can plan their work better. Some apps suggest the best time to plant crops based on soil and climate conditions. Farmers can also use apps to check market prices, sell their products online, and buy seeds or fertilizers. Apps with AI and camera features can even detect plant diseases and suggest treatments. With mobile apps, farming becomes easier, faster, and more profitable.

Exercise

Choose the correct answer from the given alternatives.

1. Which is not the operating system?

   a. MS-Word b. Android c. Linux d. Unix

2. Which is the operating system?

   a. Android b. Windows 10 c. Linux d. All of the above

Write short answer to the following questions.

1. Why does a computer need an operating system?
2. Write the difference between GUI and CUI.

Write long answer to the following questions.

1. What is an operating system? Explain its functions.
2. What is the user interface? Explain its types.
3. What is open-source software?

Project Work

1. Give a presentation on the "operating system".
2. Identify operational software utilized in various sectors, such as hospitals, hotels, and education, and conduct a group discussion on their key aims.
3. Conduct a brief interview with teachers, friends, parents, and relatives to gather information on their computer, laptop, or other device kinds, as well as the operating system installed. Also, compile a list of the apps they've used on their smartphones.

Unit 10

Multimedia System

10.1 Introduction to Multimedia

The term 'multimedia' originates from the combination of two words multi and media where 'multi' means many or more than one, and 'media' referring to channels, ways, methods, or mediums used to share ideas, feelings, or information. It encompasses the fusion of two or more types of media, such as video, sound, animation, text, and pictures. Multimedia proves highly beneficial and effective in presenting information in an understandable, engaging, and interactive manner. It empowers users to influence the material's presentation through selection and manipulation. This interactive aspect is integral to multimedia presentations, which may incorporate images, audio, video clips, or text to demonstrate concepts in various settings like training sessions, seminars, or workshops. Utilizing large screens or projectors, multimedia facilitates information display to large audiences, whether physically present or engaged in online settings. Today, online training and learning systems extensively leverage multimedia tools. Despite their advantages, multimedia files typically demand substantial storage space compared to other formats. Common storage mediums include CDs and DVDs, chosen for their compatibility, cost-effectiveness, and storage capacity. With the widespread availability of online platforms and resources, users benefit from the high-speed Internet and advanced technologies of computers and electronic devices, ensuring reliable access to multimedia content.

10.2. Components of Multimedia

Multimedia components serve as the fundamental building blocks of any multimedia project. The proficient and strategic utilization and management of these components are crucial indicators of the presentation's effectiveness and appeal. Ultimately, the primary goal of multimedia is to convey information efficiently and compellingly to the intended audience.

a. **Text:** Text serves as a vital tool for expressing information effectively. Text has been used in almost everywhere. In most of the multimedia systems text is embedded with other medias for presenting information. The text in multimedia can be animated and designed using various text formatting options. It is emphasized by different text style, fonts and color. Websites, PowerPoint Presentation, Reports are some examples of text information.

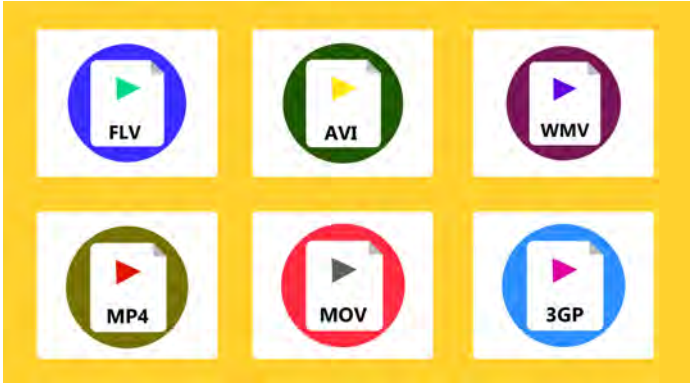
b. **Audio:** Multimedia audio refers to sound used in combination with other media, like images, videos, or animations, to create a more engaging experience. It's the sound we hear in movies, music, video games, and websites, helping to enhance the message or mood. Audio can include voice recordings, music tracks, sound effects, and background sounds. In multimedia, audio is often synchronized with visuals to make the content more lively and interactive, like when you watch a movie and hear the dialogue or sound effects happening along with the action.

c. **Image:** An image can be a graphic, chart, or picture. It's a really powerful and eye-catching part of multimedia that helps share information with the audience. They say a picture is worth a thousand words because images can simply convey a lot of information. In any presentation or media, graphics are essential because they grab people's attention and make information easy to understand. When you combine text with graphics, it helps people grasp the subject. Information presented with graphics also tends to stick in people's minds longer than just text. It's usually a good idea to include at least one picture related to the content on a webpage or document. Most web applications and pages use graphics to make things interactive and engaging. Things like forms, buttons, menu bars, icons, and scroll bars

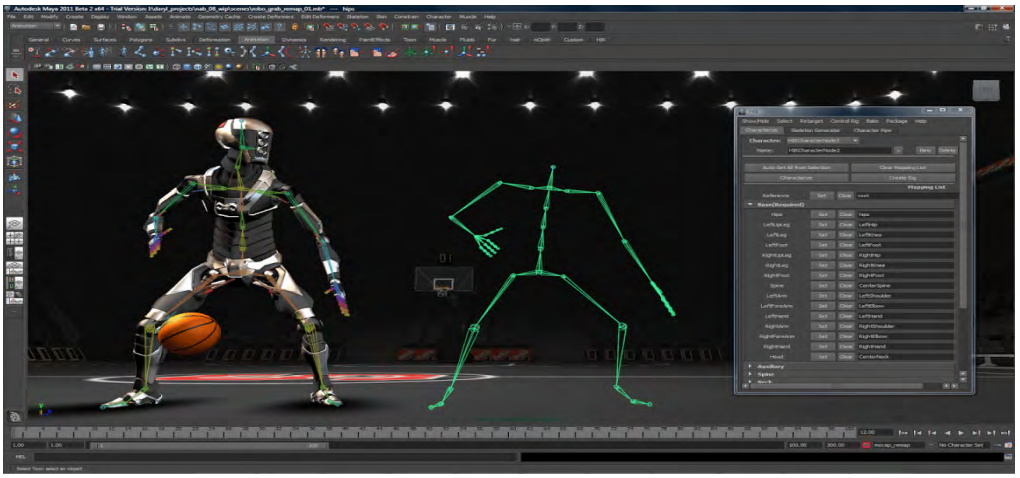
all show how important graphics are in any application. Multimedia files support various image formats like .jpeg, .jpg, .tiff, .png, .gif, and more.

d. **Video:** Video is one of the best ways to show information quickly. It involves recording and displaying sequences of pictures in a short amount of time to create motion, basically, moving pictures. Adding relevant and realistic videos to a multimedia presentation makes it more effective by entertaining and impressing the audience. Videos help clarify concepts and can serve as evidence in research, projects, or work to improve performance. They also help people remember information for longer.

Nowadays, videos are essential sources of information and are integral to multimedia. Examples include television, documentaries, movies, YouTube, and other online videos. There are various video formats like MP4, MPEG, AVI, Flash, WMV, and QuickTime.



e. **Animation:** Animation is the art of creating moving images through a sequence of still drawings, models or computer-generated graphics. Animation is when you make things look like they're moving by showing a series of pictures. Computer animation is a technology that makes these moving images appear on a screen. It's used to show things, objects, characters, or ideas that might not be possible in real life. Animation is like bringing objects to life in computer graphics. It can make even the most lifeless things seem lively and full of emotions. Computer animation is used in many different fields like movies, education, online shopping, art, and training. In entertainment, it's a big deal because a lot of backgrounds and scenes are created with special effects and animation.



Multimedia Software

Multimedia software plays a vital role in agriculture by providing interactive learning tools, farm management systems, and precision farming solutions. Software like GIS tools (ArcGIS, QGIS) helps farmers analyze soil and crop health using digital maps, while farm management apps (FarmLogs, AgriWebb) track farm activities and predict yields. Educational platforms and simulation tools allow students to explore plant growth, soil quality, and pest control through virtual labs and animations. Additionally, weather forecasting apps and pest identification software help farmers make informed decisions. These

multimedia tools improve efficiency, enhance learning, and support sustainable farming practices.

GIS (Geographic Information System)

GIS (Geographic Information System) is a computer system that helps farmers collect, store, and analyze information about land, soil, weather, and crops using maps. It helps make better farming decisions.

Use of GIS in Agriculture

a. **Mapping Farmland:** GIS creates detailed maps of farms. These maps show soil types, water sources, and which crops grow best in different areas.

b. **Precision Farming:** GIS helps farmers apply the right amount of water, fertilizer, and pesticides only where needed. This reduces waste and increases crop yield.

c. **Soil and Crop Monitoring:** Farmers can use GIS to check soil health and predict which areas need extra care. This helps in growing healthier crops.

d. **Weather and Climate Analysis:** GIS collects weather data like temperature, rainfall, and wind patterns. Farmers can use this information to protect crops from extreme weather.

e. **Pest and Disease Control:** GIS helps track pest outbreaks and plant diseases. Farmers can take action before the problem spreads.

f. **Water Management:** GIS helps plan irrigation systems to ensure crops get the right amount of water. This saves water and prevents over-watering.

g. **Farm Planning and Decision Making:** Farmers use GIS to decide what to plant, when to harvest, and how to use their land efficiently.

10.3. Application of Multimedia

Business

Multimedia has various uses in business, making it an essential component. One crucial aspect in business is advertising products to inform customers about them. Multimedia, combined with communication technology, has facilitated global information dissemination. Many designers utilize multimedia for product promotion through various mediums like print, audio, or video. Integrating advertisements into social media and popular videos is an effective way to reach a large audience in today's world. Moreover, with team members working remotely from different locations, the workplace has become global, allowing individuals to collaborate with various companies from anywhere.

Multimedia in Business

Marketing and Advertising

Multimedia advertising involves using animation and graphic design to promote and sell products or services. Multimedia technology is employed to create attractive and engaging advertisements. This technology is particularly effective for launching new products, garnering attention, and boosting marketing efforts at a reasonable cost. Flying banners, video transitions, animations, and sound effects are common features of multimedia commercials used to attract consumers and increase sales. Through strategies like search engine optimization, keyword research, and strategic linking, companies can broaden their audience reach and increase sales. By attracting more website visitors, the likelihood of converting them into customers also rises.

Additionally, there are various other forms of multimedia advertising available, including DVDs, CD-ROMs, videos, and online advertising, which serve to raise awareness of the company and its products.

Entertainment

Entertainment stands as one of the most thrilling applications of multimedia. The entertainment industry heavily relies on this technology, especially in

crafting lifelike gaming experiences. Numerous multimedia games are now accessible on computers, with online gaming featuring multiple players gaining immense popularity. Integrated audio and video effects contribute significantly to enhancing the entertainment value of various game genres.

Special technologies like virtual reality have taken gaming experiences to new heights, offering immersive simulations akin to real-life scenarios. A prime example of this is the flight simulator, which replicates real-world flying experiences. Children, in particular, find these experiences exhilarating, enabling them to engage in activities such as driving different types of cars, piloting aircraft, playing musical instruments, or even enjoying a round of golf. Social media entertainment has expanded rapidly. Digital platforms have created a new market and influences to content creators, their fans, and subscribers.

Education

Multimedia technology provides educators with innovative learning methods that can be implemented in both classroom and home settings. Equipping teachers with multimedia learning resources enables them to facilitate constructive concept development and focus on individualized instruction. Moreover, extending the use of multimedia resources to home environments presents an opportunity to enhance distance learning experiences.

Multimedia in Education

Numerous educational computer games are now accessible, offering interactive learning experiences. For instance, consider an educational game that introduces various rhymes to children. In addition to playing rhymes, children can engage in activities like painting pictures and adjusting the size of objects, fostering creativity and cognitive development. Furthermore, there are various multimedia packages available on the market that offer comprehensive information and interactive features designed specifically for children.

Bank

In recent times, multimedia has found increasing applications in banks, which serve as another public space where it is utilized. People visit banks for various purposes, such as opening savings or current accounts, depositing funds, withdrawing money, learning about different financial schemes, and obtaining loans. Banks have a wealth of information to share with their customers, and multimedia serves as an effective tool for this purpose.

Hospital

In hospitals, multimedia serves a critical role in real-time patient monitoring, especially for those in critical condition or involved in accidents. Patient conditions are continuously displayed on computer screens, enabling doctors and nurses to be alerted to any changes observed. Moreover, multimedia facilitates remote consultations, allowing surgeons or experts to watch ongoing surgeries on their PC monitors and provide online advice as needed.

Multimedia in Agriculture

Multimedia, which includes videos, images, animations, and audio, helps farmers learn better ways to grow crops and take care of animals. Agricultural training videos show step-by-step methods for planting, irrigation, and pest control, making it easier for farmers to understand. Weather apps and satellite images help predict rain and drought, so farmers can plan ahead. Online marketplaces with pictures and descriptions help farmers sell their products easily. Virtual reality (VR) is even used to train farmers without needing real fields.

Exercise

Choose the correct answer from the given alternatives.

1. Which of the following is not a component of multimedia?

   a. Text, b. Audio,
   c. Animation, d. All of the above.

2. Recorded sound or speech is also called as...

   a. Video b.Animation
   c. Sound d. Graphics.

3. Computer-generated graphics belong under...

   a. Graphics, b. Video
   c. Imagination, d. All of the above

4. Consecutive presentation of real visuals can be.....

   a. Video b. Animation
   c. Image d.None of the above

5. The illusion created by displaying frames consecutively.....

   a. Video b. Graphics
   c. Design d. Animation

6. Which of the following is multimedia software?

   a. VLC Media Player b. Windows Media Player
   c. PowerPoint d. All of the above.

Write short answer to the following questions.

1. Define multimedia.
2. Is a video a multimedia component?
3. Write two applications of multimedia in education.

4. How can we use multimedia in entertainment?
5. List any three applications of multimedia in bank.
6. List any three applications of multimedia in Health.

Write long answer to the following questions.

1. What is multimedia? List its necessity in recent world.
2. Explain different component of multimedia.
3. What are the different applications of multimedia?
4. Explain the different application of multimedia in entertainment and education.
5. How can we use multimedia in education?
6. What is the role of multimedia in education?
7. What is the role of multimedia in entertainment?
8. How are filmmakers helped by multimedia technology?
9. Do you agree that multimedia enhances the learning capacity of students? How?

Project Work

1. Make a presentation on “Multimedia Applications”.
2. Make a presentation on “Elements of multimedia”.
3. Prepare a multimedia presentation on any contemporary topic.

Computer Network and Topologies

Unit 11

11.1 Introduction of Computer Networks

A computer network is a system of connected computers and devices that can share information and resources, such as files, printers, or Internet access. These devices are linked using cables, wireless signals, or both, allowing them to communicate with each other. Networks can be small, like the one in your home, or large, like those that connect businesses and entire cities. There are different types of networks, like local area networks (LAN) for small areas and wide area networks (WAN) for large, spread-out regions. Computer networks make it easier to share data and collaborate over long distances.

11.2 Types of Network (LAN, MAN, WAN,)

There are several types of computer networks, each designed for different purposes. A Local Area Network (LAN) is used to connect computers and devices within a small area, like a home or office, allowing them to share resources quickly. A Wide Area Network (WAN) covers larger areas, such as cities or countries, and connects multiple LANs together, like the Internet. A Metropolitan Area Network (MAN) is bigger than a LAN but smaller than a WAN, often used to connect buildings or campuses in a city. Lastly, a Personal Area Network (PAN) is a small network for connecting personal devices, like smartphones, tablets, and laptops, usually over a short range.

a. Local Area Network(LAN)

A Local Area Network (LAN) is a network that connects computers and devices within a small area, like a home, office, school, or building. It allows these devices to share resources such as printers, files, and Internet access. LANs are fast and reliable because the connected devices are close to each other, usually linked

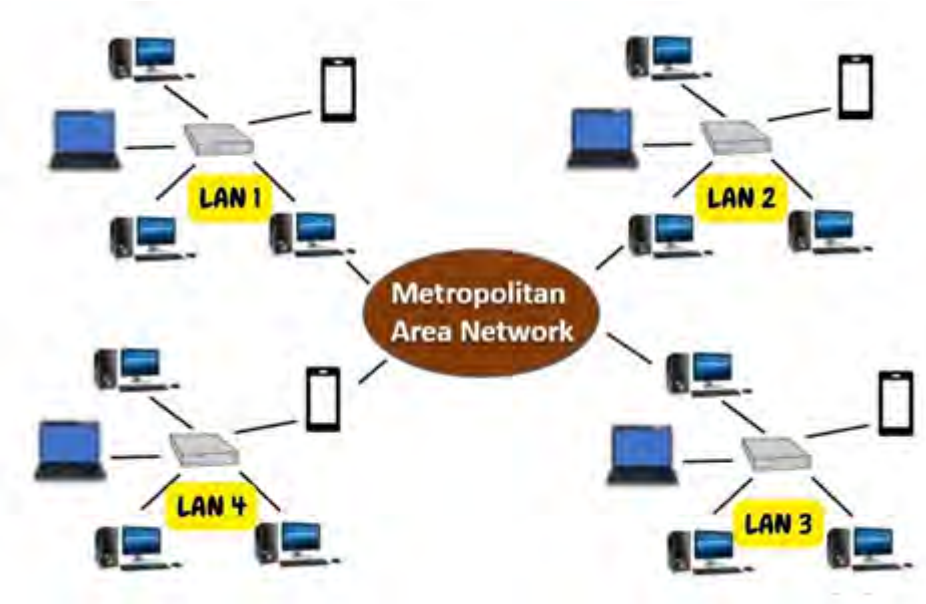
with cables or Wi-Fi. For example, in an office, all the computers might be part of a LAN, enabling employees to share documents or access a shared printer. LANs are simple to set up and are commonly used for small-scale networking needs.

b. **Metropolitan Area Network(MAN)**

A Metropolitan Area Network (MAN) is a network that connects multiple Local Area Networks (LANs) across a larger area, such as a city or a large campus. It is bigger than a LAN but smaller than a Wide Area Network (WAN). MANs are often used by organizations, businesses, or governments to connect their offices in different parts of a city. For example, a university might use a MAN to link its various buildings, allowing students and staff to share resources and communicate. MANs typically use high-speed connections, like fiber optics, to ensure fast and reliable data transfer.

Features of MAN

- It covers larger geographical area than LAN.
- The number of computers connected are also more than LAN.
- Multiple LANs are connected to form a MAN
- It is owned by single or multiple organizations.



c. Wide Area Network(WAN)

A Wide Area Network (WAN) is a network that connects computers and devices over a large area, such as across cities, countries, or even the whole world. It's much bigger than a Local Area Network (LAN) or a Metropolitan Area Network (MAN). The Internet is the best example of a WAN, connecting millions of networks and devices globally. Businesses often use WANs to link their offices in different locations, enabling them to share information and resources. WANs use various technologies, like fiber optics, satellite links, and wireless connections, to ensure long-distance communication.

11.3 Topologies of LAN (Ring, Bus, Star, Mesh and Hybrid topologies)

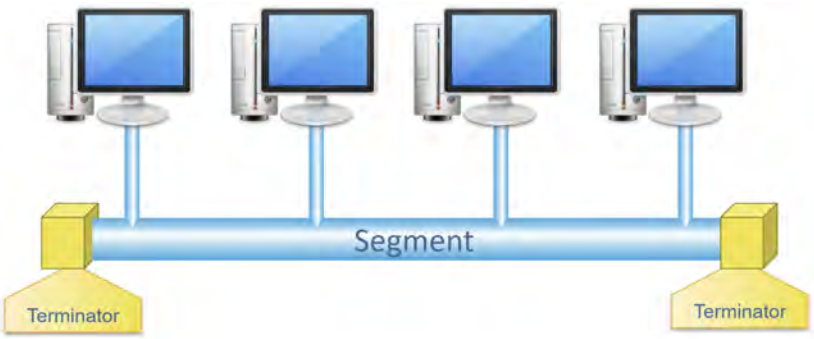
Network topology refers to the way computers, devices, and other components are arranged and connected in a network. It defines the layout of a network and how data flows between devices. There are different types of network topologies, such as star topology, where all devices connect to a central hub; bus topology, where all devices share a single communication line; ring topology, where devices are connected in a circle; and mesh topology, where every device connects directly to others. The choice of topology depends on factors like the size of the network, cost, and performance needs. It plays a key role in how well a network operates. The basic network topologies are:

i. Bus or linear topology
ii. Star topology
iii. Ring topology
iv. Mesh topology
v. Hybrid topology

i. Bus or Linear Topology

Bus topology is a simple way to set up a network where all computers and devices

are connected to a single communication line, called a bus or backbone. Data travels along this line, and devices take turns sending and receiving information. It's easy and inexpensive to set up because it requires fewer cables compared to other topologies. However, if the main bus line is damaged, the entire network stops working. Bus topology is suitable for small networks with a limited number of devices but is less efficient for larger networks due to data collisions and slower performance.

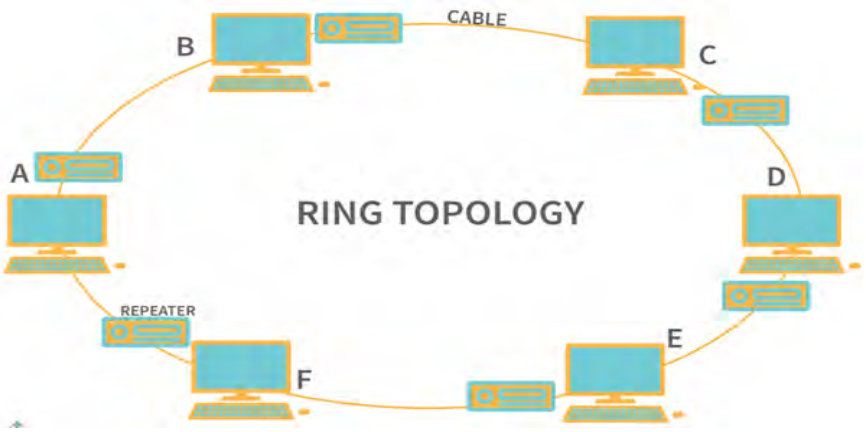


ii. **Star Topology**

In a star topology, all computers and devices are connected to a central device, such as a hub or switch, forming a shape like a star. The central device acts as the main point for communication, and all data passes through it. This setup is easy to manage and troubleshoot because if one device fails, it doesn't affect the others. However, if the central hub or switch stops working, the entire network goes down. Star topology is commonly used in homes, offices, and schools because it's reliable and supports high-performance communication.

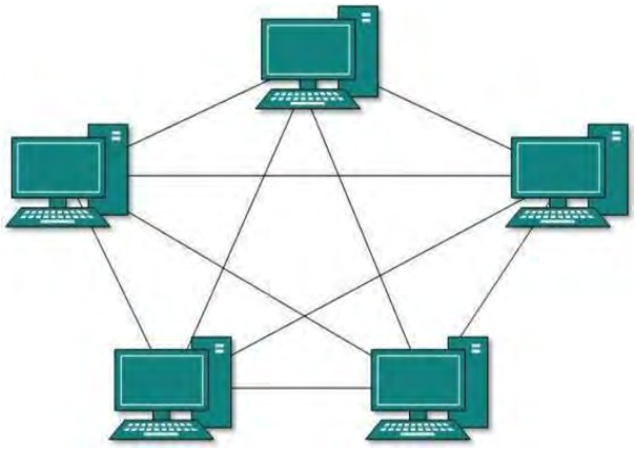
iii. **Ring Topology**

In a ring topology, all computers and devices are connected in a circular shape, forming a closed loop. Each device is connected to two others: one on its left and one on its right. Data travels in one direction (or sometimes both directions in a dual-ring topology) around the ring until it reaches its destination. Ring topology is simple and organized, and each device gets a chance to send data without collisions. However, if one device or connection fails, the whole network can stop working unless special mechanisms are in place. It's less common today but was used in older networks.



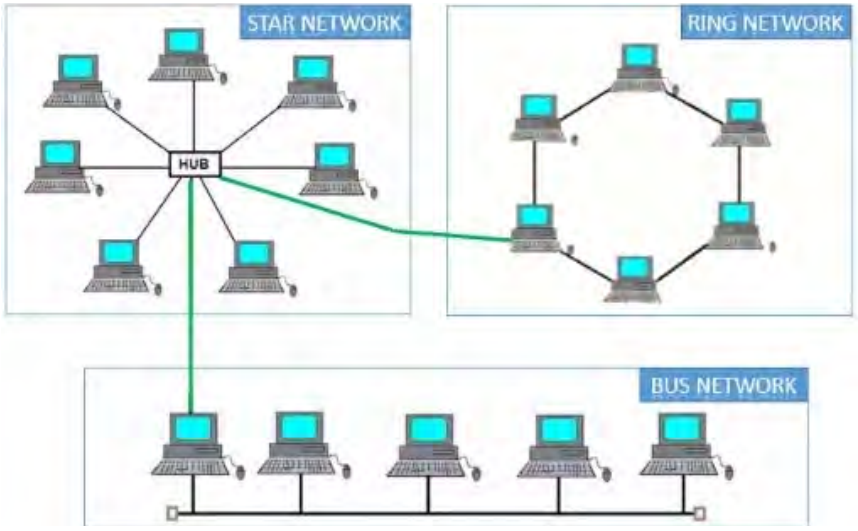
iv. Mesh Topology

In a mesh topology, every device in the network is connected to every other device, creating multiple paths for data to travel. This setup ensures high reliability because if one connection fails, data can still use another path to reach its destination. There are two types: full mesh, where all devices are directly connected, and partial mesh, where only some devices are directly connected. While mesh topology is highly efficient and fault-tolerant, it can be expensive and complex to set up because it requires a lot of cables and configurations. It's often used in critical systems like military or banking networks, where reliability is essential.



v. Hybrid Topology

Hybrid topology is a combination of two or more different network topologies, like star, bus, ring, or mesh, to create a system that meets specific needs. It takes the strengths of each topology to build a more flexible and efficient network. For example, a company might use a star topology in its departments and connect them with a bus topology. Hybrid networks are scalable, meaning they can grow easily, and they can handle different types of data traffic well. However, they can be complex and costly to set up and manage because they involve multiple designs and technologies.



11.4 Use of Communication in Daily Life

Communication enabling the exchange of ideas, emotions, and information. It forms the foundation of human interaction and is essential for personal, social, and professional relationships.

In personal life, communication allows individuals to express their feelings, build connections, and maintain relationships with family and friends. Whether through face-to-face conversations, phone calls, or instant messaging, effective communication fosters understanding and emotional bonding. It also helps resolve conflicts and strengthens trust among individuals. Socially, communication is crucial for participation in community activities and societal engagement. It helps people share cultural values, spread awareness, and collaborate on common goals. In the professional world, communication is indispensable for teamwork, leadership, and achieving organizational objectives. Clear communication ensures that tasks are understood, goals are aligned, and feedback is effectively shared. Emails, presentations, and meetings are common modes of professional communication, aiding in productivity and collaboration.

Exercise

Choose the correct answer from the given alternatives.

1. A hub is connected in……..

   a. Ring Topology b. Bus Topology

   c. Star Topology d. None of above

2. A …… is two or more LANs connected together, generally across large geographical area.

   a. CAN b. MAN

   c. WAN d. SAN

3. The connection pattern of computers in network is…….

   a. Protocol b. Topology \

   c. Twisted pair d. All of them

Write short answer to the following questions.

1. Arrange computer networks based on size.
2. Define LAN's features.
3. What is MAN? Mention any three attributes.
4. Define network topology. List the different types.
5. Draw a diagram showing star topology.
6. Define the bus topology.
7. What is ring topology?

Write long answer to the following questions.

1. Compare and contrast LAN and MAN.
2. Explain LAN, MAN, and WAN with figures.
3. What is star topology? Explain with a figure.

4. Compare and contrast star and ring topologies.
5. Use a figure to explain the bus topology.
6. Use a diagram to define the ring topology.

Project Work

1. Draw on chart paper “Types of computer network” and paste in your class room.
2. Collect the names of network used in different places like hospital, hotel, educational instutute, etc. from your surrounding and demonstrate in a sheet of chart paper.
3. Prepare a presentation file on a topic “Types of tolpology use in Nepal” and demonstrate in your class as a group work.

Internet and its Application

Unit 12

12.1 Introduction to Internet

The Internet is a global network that connects millions of computers and devices, allowing people to share information, communicate, and access services from anywhere in the world. It works by linking smaller networks together using a system of cables, satellites, and wireless connections. Through the internet, we can browse websites, send emails, watch videos, play games, and use social media. It's like a giant web that connects individuals, businesses, and governments, making it an essential part of modern life for learning, working, and staying connected.

Importance of the Internet in Agriculture

The Internet helps farmers access important information quickly, making farming smarter and more efficient. Farmers can check weather forecasts online to plan their planting and harvesting. They can learn new farming techniques from videos, articles, and online courses. The internet also helps farmers sell their products through e-commerce platforms, reaching more customers without traveling. Mobile apps and websites provide real-time updates on crop prices,

helping farmers get better deals. With smart farming, the Internet connects sensors and devices to monitor soil, water, and plant health. By using the internet, farmers can increase productivity, reduce costs, and improve their income.

Advantages of Internet

a. Information Sharing
b. Faster Communication.
c. Abundant Information
d. Better educational opportunities.
e. Varieties of ways for entertainment.
f. Online Services
g. Social connectivity

Disadvantages of Internet

a. Internet Addiction
b. Increase in cyber crime
c. Chance of spreading computer viruses
d. Social Alienation

e. Spam

f. Fake news

g. Health Issues

12.2. Introduction to Web Browser, Website, Web page, Home page

Web Browser

A web browser is a software application that allows you to access and view websites on the Internet. It helps you navigate the web by typing in a website address (URL) or clicking on links. Popular web browsers include Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge. The browser displays the content of websites, like text, images, and videos, so you can easily browse the Internet. It also allows you to interact with websites, fill out forms, and download files. Without a web browser, you wouldn't be able to access or use most of the internet.

Website

A website is a collection of related web pages, like a digital booklet, that can be accessed through the Internet. Each website has a unique address, called a URL, that lets you find it easily. Websites can include text, images, videos,

and interactive features that provide information or allow you to do things like shopping, learning, or socializing. For example, a news website might give you the latest headlines, while a shopping website lets you buy products online. Websites are created by individuals, businesses, and organizations to share content or offer services to visitors.

Web Page

A web page is a single page on the Internet that can be viewed using a web browser. It's like a digital page in a book and is part of a larger website. Each web page can contain text, images, videos, and links to other pages or websites. For example, the home page of a website is a web page, and it might include links to other pages within the site. When you click on a link or enter a web address, your browser takes you to a specific web page. Web pages are created using special coding languages like HTML.

Home Page

A home page is the first page you see when you visit a website. It serves as the main entry point and usually provides an overview of what the website is about. On the home page, you might find links to other important pages, like products, services, or contact information. It often includes the website's logo, navigation menu, and sometimes news or updates. The home page is like the "front door" of a website, guiding visitors to the content they're looking for or helping them understand the purpose of the site.

12.3 Application of Internet

12.3.1 Search Engine

A search engine is a software or website which helps to search information based on keywords. It searches the content via WWW. The searched content is displayed in the form of a website, image, video, or other media. Google, Ask, and Bing are some of the popular search engines. Archie is considered to be the first search engine that is used to search files over FTP.

12.3.2 Email

Email, short for electronic mail, constitutes a fundamental service of the Internet, facilitating the electronic delivery of messages. It serves as a platform for efficient and inexpensive real-time communication, allowing users to send not only text but also attached files and documents. Sending an email requires the email addresses of both the sender and recipient. Ray Tomlinson, a computer expert, sent the first email in 1971, setting a new standard for digital communication. An email address, or email ID, is a unique identification for an electronic mailbox on a computer network. Each individual has a unique email address that consists of two elements separated by the "@" symbol: the username and the hostname. Example: abc.example@gmail.com. Here, the login is abc.example, and the hostname is gmail.com.

Advantages of Email

a. It is the fastest medium of communication.
b. It is the cheapest means of communication.
c. Email is reliable and secret.
d. It helps to keep mail as a backup also.
e. We can send the same mail to multiple email addresses.
f. It supports various kinds of attachments.

12.3.3 E-commerce

E-commerce is a big hit on the Internet. It's all about buying and selling stuff using the Internet. Many websites let you shop online and get things delivered to your home. This is all possible because of the Internet. In Nepal, websites like www.daraz.com.np and www.hamrobazaar.com are quite popular for online shopping. The first-ever e-commerce company, Boston Computer Exchange, started in 1982.

In Nepal, several e-commerce platforms are enhancing the agricultural sector by connecting farmers, suppliers, and consumers. Here are some

notable platforms

a. **Agrobase Nepal**: A multi-vendor e-commerce platform catering to agro vets, suppliers, farmers, and traders. It offers timely and relevant information to users. agrobasenepal.com

b. **Thulo.Com's Agriculture Marketplace**: A one-stop destination for buying and selling high-quality agricultural products and equipment, offering a wide range of categories including fresh produce and farm machinery. thulo.com.np

c. **Geokrishi**: A digital platform providing farmers with access to timely and context-specific advisories, market prices, weather forecasts, and best farming practices through a mobile app. geokrishi.farm

d. **Krishidoot**: An e-commerce platform dedicated to the agriculture sector, aiming to digitize the agricultural system in Nepal and create big data incorporating agriculture, livestock, and poultry sectors to increase productivity and market access. krishidoot.agrinepal.com

e. **Muktinath Krishi Company**: A pioneer public company in the agriculture sector, established in 2018, focusing on promoting agriculture through a robust e-commerce marketplace platform. bagisto.com

12.3.4 E-banking

E-banking, or electronic banking, refers to the use of digital platforms and Internet technology to deliver banking services and conduct financial transactions. Customers can access their accounts, transfer payments, pay bills, manage investments, and conduct other banking activities at any time and from any location, reducing the need to visit physical bank locations. E-banking, with features such as mobile banking, online account access, and secure payment systems, provides convenience, time savings, and cost efficiency. However, it also introduces concerns to cybersecurity and the requirement for digital literacy, necessitating user awareness and secure behaviors.

12.3.4. E-governance

E-government, also termed electronic governance, involves the utilization of digital technology and information communication technologies (ICTs) by governments to deliver public services, interact with citizens, and enhance governance procedures. E-government programs aim to increase the efficiency, transparency, and accessibility of public services such as healthcare, education, taxation, and administrative processes. Through the utilization of online platforms, mobile apps, and electronic databases, e-government enables convenient access

to government services and information, simplifies bureaucratic procedures, and encourages citizen engagement in decision-making. Furthermore, e-government endeavors lead to cost reductions, decreased paperwork, and heightened accountability in government operations, ultimately fostering improved governance and responsiveness to citizen needs in the digital era.

Exercise

Choose the correct answer from the given alternatives.

1. What is the delivery of governmental services using ICT tools?

   a. e-governance b. Ecommerce

   c. Online form d. None of the above

2. Which of the following is service of the Internet?

   a. Email b. Newsgroup

   c. Telnet d.. All of above

3. Choose the correct email id.

   a. abcd@gmail.com b. abcdgmail.com

   c. abcdgmail@.com d. @abcdgmailcom.

4. Which of the following is the discussion platform where individuals engage in sharing their thoughts?

   a. Usenet b. Telecommunication

   c. Newspaper d. Web browser

5. What is the process of buying and selling goods through internet?

   a. Online business b. Daraz

   c. Ecommerce d. E-governance

6. Which of the program helps users to search information over WWW?

   a. Search engine b. Chrome

   c. Browser d. Firefox

7. Which of the following is a search engine?

   a. Google b. Yahoo c. Bing d. All of the above

Write short answer to the following questions.

1. What is the Internet?
2. List the major requirements of an internet connection.
3. What is email? List the advantages of email.
4. What is e-commerce?
5. Define e-Governance.

Write long answer to the following questions.

1. What are the different services available over the internet? Describe their uses.
2. What is WWW? What are the advantages of WWW?
3. What are the several e-commerce platforms that enhancing the agricultural sector in Nepal?

Project Work

1. Collect the name of the ISP provider in your locality.
2. Make a presentation on “Internet Applications”.
3. Prepare a PowerPoint Presentation file on the topic 'Current trends of the internet and its use in Nepal'.

References

Anderson, J. R., & Feder, G. (2004). Agricultural extension: Good intentions and hard realities. The World Bank Research Observer, 19(1), 41–60.

https://doi.org/10.1093/wbro/lkh013

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

UNESCO. (2015). Education for All 2000-2015: Achievements and challenges. United Nations Educational, Scientific, and Cultural Organization.

Van den Ban, A. W., & Hawkins, H. S. (1996). Agricultural extension (2nd ed.). Blackwell Science.

Ministry of Agriculture and Livestock Development (MoALD), Nepal. (2020). Annual report 2020. Government of Nepal.

Khanal, N. R. (2019). History of agriculture in Nepal: From subsistence to modernization. Kathmandu University Journal of Science, Engineering, and Technology, 15(1), 1-15.

Van den Ban, A. W., & Hawkins, H. S. (1996). Agricultural extension (2nd ed.). Blackwell Science.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

Food and Agriculture Organization of the United Nations. (2014). Communication for rural development guidelines.

Retrieved from http://www.fao.org/3/i3492e/i3492e.pdf

Leeuwis, C., & Van den Ban, A. (2004). Communication for rural innovation: Rethinking agricultural extension (3rd ed.). Wiley-Blackwell.

Ministry of Agriculture and Livestock Development. (2020). Annual report 2020. Government of Nepal.

Axinn, G. H. (1988). Guide on alternative extension approaches. Food and Agriculture Organization of the United Nations.

United Nations Educational, Scientific and Cultural Organization. (2015). Education for all 2000-2015: Achievements and challenges. UNESCO.

Axinn, G. H. (1988). Guide on alternative extension approaches. Food and Agriculture Organization of the United Nations.

Food and Agriculture Organization of the United Nations. (2014). Communication for rural development guidelines. Retrieved from http://www.fao.org/3/i3492e/i3492e.pdf

Giddens, A., & Sutton, P. W. (2021). Sociology (9th ed.). Polity Press.

Ministry of Agriculture and Livestock Development. (2020). Annual report 2020. Government of Nepal.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

United Nations Development Programme. (2013). Human development report: Sustainability and equity: A better future for all. Retrieved from https://hdr.undp.org

United Nations Educational, Scientific and Cultural Organization. (2015). Education for all 2000-2015: Achievements and challenges. UNESCO.

Van den Ban, A. W., & Hawkins, H. S. (1996). Agricultural extension (2nd ed.). Blackwell Science.

World Bank. (2006). World development report 2006: Equity and development. World Bank Publications.

Yadav, R. P. (2007). Social mobilization in Nepal: Concepts, practice, and challenges. International Centre for Integrated Mountain Development.

Rogers, E. M. (2003). Diffusion of innovations (5th ed.). Free Press.

Oakley, P., & Garforth, C. (1985). Guide to extension training. Food and Agriculture Organization of the United Nations.

Van den Ban, A. W., & Hawkins, H. S. (1996). Agricultural extension (2nd ed.). Blackwell Science.

National Planning Commission. (2015). Sustainable development goals, status, and roadmap: 2016–2030. Government of Nepal.

Food and Agriculture Organization of the United Nations. (2017). Monitoring and evaluation for learning and performance improvement. FAO.

Singh, R. P., & Asokan, R. (2005). Agricultural extension: Impact and assessment. Agrotech Publishing Acade-my.

References

Birchall, J. (2004). Cooperatives and the millennium development goals. International Labour Organization.

FAO. (2012). Farmer field schools: A participatory method for agricultural extension. Food and Agriculture Organization of the United Nations.

Gillespie, S. (2004). Scaling up community-driven development: A synthesis of experience. International Food Policy Research Institute (IFPRI).

Northouse, P. G. (2019). Leadership: Theory and practice (8th ed.). SAGE Publications.

Oakley, P., & Garforth, C. (1985). Guide to extension training. Food and Agriculture Organization of the United Nations.

Singh, K. (2009). Rural development: Principles, policies, and management (3rd ed.). SAGE Publications.

References

CIDA. (1999). Gender equality and sustainable development: A guide to gender analysis (2nd ed.). Canadian International Development Agency.

Moser, C. O. N. (1993). Gender planning and development: Theory, practice, and training. Routledge.

Oakley, P. (2001). Gender and development: A critical review. Development in Practice, 11(2), 215-225. https://doi.org/10.1080/09614520110034835

Rathgeber, E. M. (1990). WID, WAD, GAD: Tracing the root of gender and development debates. Development, 3(2), 6-13.

World Bank. (2012). World development report 2012: Gender equality and development. The World Bank.