

DVTEE 202

**Technology Enabled Education:
Concept and Tools- II**

School of Vocational Studies



उत्तराखण्ड मुक्त विश्वविद्यालय

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INDEX

UNIT	DESCRIPTION	PAGE NO.
1	TECHNOLOGY CENTRIC EDUCATION AND OPEN & DISTANCE EDUCATION INTRODUCTION OBJECTIVES OVERVIEW OF OPEN AND DISTANCE EDUCATION HISTORICAL DEVELOPMENT OF OPEN AND DISTANCE EDUCATION KEY FEATURES OF OPEN AND DISTANCE EDUCATION ROLE OF OPEN AND DISTANCE LEARNING IN PRESENT SCENARIO OPEN AND DISTANCE LEARNING AND TECHNOLOGY CENTRIC EDUCATION POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS	7-16
2	ROLE OF TECHNOLOGY ENABLED EDUCATION IN OPEN AND DISTANCE LEARNING INTRODUCTION OBJECTIVES TECHNOLOGY ENABLED EDUCATION AND OPEN AND DISTANCE LEARNING OPEN AND DISTANCE LEARNING GOVERNING BODIES IN INDIA QUALITY ASSURANCE IN IN OPEN AND DISTANCE LEARNING FUTURISTIC SCENARIO OF OPEN AND DISTANCE LEARNING POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS	17-23
3	AN INTRODUCTION TO AUDIO AND VIDEO EDITING TOOLS INTRODUCTION OBJECTIVES ROLE OF AUDIO AND VIDEO IN TEACHING LEARNING POPULARLY USED OPEN-SOURCE TOOLS FOR EDITING HARDWARE SOFTWARE REQUIREMENT FOR AUDIO AND VIDEO EDITING OVERVIEW OF AUDACITY AUDIO EDITING TOOL OVERVIEW OF OPENSHOT VIDEO EDITING TOOL POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES	24-31

	SUGGESTED READINGS	
4	<p>VIDEO CONFERENCING</p> <p>INTRODUCTION</p> <p>OBJECTIVES</p> <p>APPLICATIONS OF VIDEO CONFERENCING</p> <p>HARDWARE & SOFTWARE REQUIREMENTS FOR VIDEO CONFERENCING</p> <p>STEP BY STEP CONFIGURATION FOR VIDEO CONFERENCING</p> <p>TOOLS USED FOR VIDEO CONFERENCING</p> <p>VIDEO CONFERENCING VENDORS</p> <p>WORKING OF VIDEO CONFERENCING</p> <p>POINTS TO REMEMBER</p> <p>GLOSSARY</p> <p>CHECK YOUR PROGRESS</p> <p>BIBLIOGRAPHY/ REFERENCES</p> <p>SUGGESTED READINGS</p>	32-48
5	<p>VIDEO CHANNEL MANAGEMENT (YOUTUBE)- TOOLS AND ACTIVITIES</p> <p>INTRODUCTION</p> <p>OBJECTIVES</p> <p>YOUTUBE CHANNEL: AN OVERVIEW</p> <p>BENEFITS OF YOUTUBE CHANNEL</p> <p>TYPES OF YOUTUBE CHANNEL</p> <p>YOUTUBE MARKETING: OVERVIEW</p> <p>CHANNEL MANAGEMENT</p> <p>POINTS TO REMEMBER</p> <p>GLOSSARY</p> <p>CHECK YOUR PROGRESS</p> <p>BIBLIOGRAPHY/ REFERENCES</p> <p>SUGGESTED READINGS</p>	49-62
6	<p>TECHNOLOGY ENABLED EDUCATION- INSTITUTIONAL INITIATIVES- II</p> <p>INTRODUCTION</p> <p>OBJECTIVES</p> <p>OVERVIEW OF TECHNOLOGY ENABLED EDUCATION</p> <p>INTRODUCTION TO SHODHGANGA-INFLIBNET</p> <p>BRIEF DESCRIPTION OF RESOURCES AVAILABLE AT INFLIBNET</p> <p>OVERVIEW TO NCERT E-INITIATIVES</p> <p>POINTS TO REMEMBER</p> <p>GLOSSARY</p> <p>CHECK YOUR PROGRESS</p> <p>BIBLIOGRAPHY/ REFERENCES</p> <p>SUGGESTED READINGS</p>	63-73
7	<p>TECHNOLOGY ENABLED LEARNING TOOLS/ PLATFORMS- II</p> <p>INTRODUCTION</p> <p>OBJECTIVES</p> <p>OVERVIEW OF TECHNOLOGY ENABLED LEARNING PLATEFORMS</p> <p>VIRTUAL LABS</p> <p>SWAYAM PRABHA</p> <p>SPOKEN TUTORIAL</p> <p>CONSORTIUM FOR EDUCATIONAL COMMUNICATION</p> <p>MISCELLANEOUS TOOLS</p> <p>POINTS TO REMEMBER</p> <p>GLOSSARY</p> <p>CHECK YOUR PROGRESS</p>	74-82

	BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS	
8	INTRODUCTION TO LEARNING MANAGEMENT SYSTEM INTRODUCTION OBJECTIVES BENEFITS OF USING LEARNING MANAGEMENT SYSTEMS LEARNING MANAGEMENT SYSTEM (LMS)- AN OVERVIEW APPLICATIONS OF LMS POPULAR LEARNING MANAGEMENT SYSTEM IN PRACTICE HOW LMS USEFUL For EDUCATIORS? AN INTRODUCTION TO MOODLE LEARNING MANAGEMENT SYSTEM POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS	83-101
9	INTRODUCTION TO CONTENT MANAGEMENT SYSTEM INTRODUCTION OBJECTIVES CONTENT MANAGEMENT SYSTEM WORDPRESS- A BRIEF INTRODUCTION WORDPRESS DASHBOARD CREATE A WORDPRESS WEBSITE / BLOG WORDPRESS POST WORDPRESS LINKS AND GOOGLE MAP IN WORDPRESS POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS	102-121
10	AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING INTRODUCTION OBJECTIVES ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING- AN OVERVIEW APPLICATIONS OF ARTIFICIAL INTELLIGENCE FUTURE TRENDS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING ARTIFICIAL INTELLIGENCE PROGRAMMING LANGUAGES POPULAR MACHINE LEARNING METHODS POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS	122-138
11	AN INTRODUCTION TO CLOUD COMPUTING AND INTERNET OF THINGS (IoT) INTRODUCTION OBJECTIVES CLOUDING COMPUTING- AN OVERVIEW APPLICATIONS OF CLOUD COMPUTING TYPES OF CLOUD COMPUTING SERVICES: IAAS, PAAS, AND SAAS	139-156

	<p>INTERNET OF THINGS (IoT)- AN OVERVIEW HOW THE INTERNET OF THINGS (IoT) WORKS? INTERNET OF THINGS (IoT) FRAMEWORK POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS</p>	
12	<p>INTRODUCTION TO GPS AND RECENT TRENDS IN ICT INTRODUCTION OBJECTIVES IMPORTANCE AND APPLICATIONS OF GPS HARDWARE REQUIREMENT FOR GPS SOFTWARE REQUIREMENT FOR GPS IMPLEMENTATION OF GPS TOOLS RECENT TRENDS IN ICT AND GPS POINTS TO REMEMBER GLOSSARY CHECK YOUR PROGRESS BIBLIOGRAPHY/ REFERENCES SUGGESTED READINGS</p>	157-174

UNIT- 1

TECHNOLOGY CENTRIC EDUCATION AND OPEN & DISTANCE EDUCATION

1.1	INTRODUCTION
1.2	OBJECTIVES
1.3	OVERVIEW OF OPEN AND DISTANCE EDUCATION
1.4	HISTORICAL DEVELOPMENT OF OPEN AND DISTANCE EDUCATION
1.5	KEY FEATURES OF OPEN AND DISTANCE EDUCATION
1.6	ROLE OF OPEN AND DISTANCE LEARNING IN PRESENT SCENARIO
1.7	OPEN AND DISTANCE LEARNING AND TECHNOLOGY CENTRIC EDUCATION
1.8	POINTS TO REMEMBER
1.9	GLOSSARY
1.10	CHECK YOUR PROGRESS
1.11	BIBLIOGRAPHY/ REFERENCES
1.12	SUGGESTED READINGS

1.1 INTRODUCTION

The potential of Information and Communication Technology (ICT) in education greatly facilitates the acquisition and absorption of knowledge and also increases the access of education among the aspirants. It provides the opportunities to enhance educational systems, reachability, and improves policy formulation and execution. The technology centric education is a powerful tool for extending educational opportunities among the teaching-learning community. The ability of ICT is to transcend time and space which make it possible for asynchronous learning, where one can learn by his/her own pace. Today's with the access of Internet (World Wide Web), a wealth of learning resources are available in multiple forms, i.e. audio, video, animation, graphics, etc. in which almost every subject's learning material available either free (example- SWAYAM, NPTEL, NIOS, NROERs, OERs, etc) or in

payment basis (example- many online learning platforms, as- byju's). ICTs can contribute to enhance the quality of education by increasing learner motivation and engagement, facilitating the acquisition of basic skills, and enhancing teacher training. [1]

ICT is the need of 21st century workplace skills where particularly computers, the Internet, and related technologies, are becoming more and more ubiquitous. The ability to use ICTs applications effectively and efficiently is seen as representing a competitive edge in an increasingly globalized job market. 21st Century Skills not only includes technological literacy but also covers digital age literacy (consisting of functional literacy, visual literacy, scientific literacy, technological literacy, information literacy, cultural literacy, and global awareness), inventive thinking, higher-order thinking, and sound reasoning, effective communication, and high productivity. [1] However, the digital divide is a major issue between those who have access to and control of technology and those who do not have any such facilities. Fostering availability of digital teaching-learning infrastructure is an urgent need to overcome digital divide. [1]

Today's we commonly used two terms inter-changeably, i.e. Open Learning and Distance Education. They are often combined to be known as Open and Distance Learning (ODL). Open learning is a philosophy and Distance Education is the mode used for translating it into reality as the two are complementary to each other. Distance Education (DE) is an umbrella term which describes all the teaching learning arrangements in which the learner and the teacher are separated by space and time. In fact, it is a mode of delivering education and instruction to learners who are not physically present in a traditional setting of a face-to-face classroom mechanism. [2]

Transaction of the learning material (curriculum) to the learners is affected by means of specially prepared materials called Self Instructional Learning Material (SILM). The learning materials which are delivered to the learners at their doorstep through various media such as print, television, radio, satellite, audio/video tapes, CD-ROMs, Internet and World Wide Web etc. [2]

In today's digital era (in reference to Open and Distance Learning), technological medium replaces the inter-personal communication of conventional classroom-based education that takes place between the teacher and the learners. Communication between the institution, teacher and learners is mainly through electronic media (telephone, interactive radio counselling, teleconferencing, videoconferencing, chat sessions, e-mail, website, etc) and also through Learning Management System (LMS) held at virtually by the Study Centres that are set up by the DE institutions as close to the learners' homes as possible or by the DE institutions themselves. [2]

Open and Distance Learning (ODL) system has been instrumental in enhancing the access to quality higher education in India. In the coming years, challenges before ODL institutions

especially on technology integrated education and quality concerns, will be immense. For sustenance and greater impact, ODL system will have to be transformed to a learner-centric approach, coupled with technology-enabled online education system. [3]

1.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Explore Open and Distance Education (ODE).
- Explore the historical development of ODE in India.
- Define ODE in present scenario.

1.3 OVERVIEW OF OPEN AND DISTANCE EDUCATION

Over last couple of years, Open and Distance learning (ODL) institutions have successfully changed the image of ODL to multimodal technology supported education, and have become a credible alternative to conventional higher education.

Transition towards online learning can overcome some of the biggest challenges faced by conventional higher education as well as ODL. With the greater emphasis on cost effective online education which is beyond the limitation of territorial jurisdiction, the ODL Institutions have to remodel their framework aligning with technology supported learning environment. [3]

The Open and Distance Education system of study focuses on open access to education and training to make the learners free from the constraints of time and place, and offering flexible learning opportunities to individuals. Open and distance learning (ODL) is one of the most rapidly growing fields of education now a days and it has substantial impact on all education delivery systems. The new ODL system growing fast because of the development of Internet-based information technologies used for teaching-learning (Ghosh, et. al., 2012).

There are several approaches to define the term open and distance learning. Few of them are- [4]

- It is a way of separation of teacher and learner in time or place, or in both.
- It uses of mixed-media for teaching-learning which includes print, radio and television broadcasts, video, Internet-based learning.
- Following are the more commonly used terms related to open and distance learning are- correspondence education, independent study, continuing education, distance teaching, self-instruction, adult education, technology-based or technology-mediated education, learner-centred education, open learning, flexible learning, distributed learning, etc.

In Indian higher education system, the Open and Distance Learning (ODL) has a major contribution in enhancing the Gross Enrollment Ratio (GER) and ensure the accessibility of the higher education to large segments of the Indian population particularly to reach out to the unreached and to meet the demands of lifelong learning. ODL is an innovative system of university-level education which is both flexible and open in terms of methods and pace of

learning; combination of courses; eligibility for enrollment; age of entry; conduct of examination and implementation of the programmes of study. It provides an opportunity to upgrade skills and qualifications; and also develops education as a lifelong activity to enable persons to update their knowledge or acquire knowledge in new areas. [2]

Transformation of Open and Distance Learning to Online Learning-

The Ministry of education (formerly known as- Ministry of Human Resource Development), Government of India, is setting a target of GER of 40 percent by the year 2024. With greater role to be played by the Open and Distance Learning (ODL) system, it is inevitable that the ODL system will have to be transformed to a learner-centric approach, coupled with technology-enabled online education system. The key factors of such transformation are (Rao, 2020) -

- Conventional student support moved to IT enabled support system.
- Hard copy learning material moved to e-SLMs (Self Learning Material).
- Face-to-Face counselling moved to online counselling.
- Conventional ODL system (Learner -> Study Centre -> ODL Institution) moved to ICT-based Student Management System (Learner -> ODL Institution).
- Programs offerings by institution moved to online programs.

1.4 HISTORICAL DEVELOPMENT OF OPEN AND DISTANCE EDUCATION

In India, the University Grants Commission (UGC) suggested in its report for (1956-1960) the proposals for evening colleges, correspondence courses and award of external degrees should be considered. The planning commission started to think about it. In the third Five Year Plan, the need for the introduction of correspondence education in the country has been discussed. [2]

Under the chairmanship of Prof. D. S. Kothari, an expert committee has been constituted. The committee recommended the institution of correspondence courses in view of the greater flexibility, economic viability and innovative methods of imparting education. The committee also suggested that correspondence courses in India should be administered by the universities only and in the first instance, by one University, viz., the University of Delhi as a pilot project. [2]

In the year 1962, the University of Delhi's School of Correspondence Courses and Continuing Education established. After the successful drive of pilot project for distance learning in India, the next decade i.e. the 1970s saw the growth and spread of the Correspondence Education system in India, by more conventional universities opening Correspondence Course Institutes (subsequently renamed as Directorates of Distance Education/ Centres of Distance Education). The opportunity of access, affordability and convenience offered by the Distance Education system contributed to its increasing popularity and growth. [2]

Later on, it was realized that unless we will not open educational opportunities to the deprived, unless we will not remove the structural rigidities in our educational system and unless we will not integrate Information and communication technology in educational system's developments, we cannot and will not succussed in educating majority of the people and of catering to the diverse types of education that a modern society demands. [2]

In the year 1980s, the Open University system started with the objectives to further democratize opportunities for higher education to large segment of the Indian population, particularly those for whom face-to-face educational access was difficult or somehow impossible because of several hurdles, i.e. living in remote and rural areas, working people, women and other adults who wish to acquire and upgrade their knowledge and skills through studies in various fields. [2]

The Ministry of Education (Formerly known as Ministry of Human Resource Development) in its National Policy on Education (NPE) 1986, and NEP 2020, gave prominence to an Open and Distance Education system as a means to “augment opportunities for higher education and as an instrument of democratizing education”. [2]

Dr. BR Ambedkar Open University, Hyderabad (year 1982) was the first Open University in the country, followed by the establishment of Indira Gandhi National Open University at the national level by the Parliament of India in 1985. Subsequently the idea was accepted by Nalanda Open University (NOU) Patna, Bihar (year 1987); Vardhman Mahaveer Open University (VMOU), Kota, Rajasthan (year 1987); Yashwantrao Chavan Maharashtra Open University (YCMOU), Nashik, Maharashtra (year 1989). The major responsibility for the promotion and coordination of Open and Distance Education was handed over to the Indira Gandhi National Open University (IGNOU) by the Parliament of India. [2]

Thus, IGNOU has become a unique institution as it was entrusted with a dual role: of functioning like an Open University by offering programmes of education and training through distance mode and also acting as the promoter, coordinator of the Open and Distance Education system in the country and determining standards in such systems. To well performing such responsibilities, the Distance Education Council (DEC) was set up by IGNOU in the year 1991. [2]

The DEC started functioning within the broad framework, and the policies laid down by the Board of Management of IGNOU while enjoying a significant measure of autonomy in its operations. The DEC started interacting with the State Governments for establishing the State Open Universities in the respective states. As a result of DEC initiatives several State governments established Open Universities. [2]

The DEC took several initiatives for promotion, coordination and maintenance of standards of open and distance education system in the country. DEC has also developed guidelines for regulating the establishment and operation of ODL institutions in the country. In August 2010, the Ministry of Human Resource Development constituted a Committee under the Chairmanship of Prof. Madhava Menon in respect of regulation of standards of education

imparted through distance mode. As per the Menon's report recommendations the creation of a new regulatory body for ODL system, named the Distance Education Council of India (DECI) is to be required. The Menon's Committee also decided that as an interim measure, the DEC of IGNOU may be shifted to UGC. [2]

UGC notified the University Grants Commission (Open and Distance Learning) Regulations, 2017 in the official Gazette on June 23, 2017. Subsequently, several amendments in the UGC (Open and Distance Learning) Regulations, 2017 were notified in the official Gazette till date. The regulations and its amendments are available on UGC website (<https://deb.ugc.ac.in>). These Regulations lay down the minimum standards of instruction for the grant of degree at the undergraduate and post-graduate levels, through Open and Distance Learning mode. These Regulations are in addition to and not in derogation of any other Regulations, Notifications, Guidelines or Instructions issued by the Commission from time to time. After notification of the UGC (ODL) Regulations- 2017, the process for granting recognitions to HEIs for offering programmes through the ODL mode was undertaken by the UGC. (Source: <https://deb.ugc.ac.in/DEB/Regulations>)

List of State Open Universities in India-

1. Dr. B.R. Ambedkar Open University (BRAOU), Hyderabad, Andhra Pradesh.
2. Vardhman Mahaveer Open University (VMOU), Kota, Rajasthan.
3. Nalanda Open University (NOU). Patna, Bihar.
4. Yashwantrao Chavan Maharashtra Open University (YCMOU), Nashik, Maharashtra.
5. Madhya Pradesh Bhoj Open University (MPBOU), Bhopal, Madhya Pradesh.
6. Dr. Babasaheb Ambedkar Open University (BAOU), Ahmedabad, Gujarat.
7. Karnataka State Open University (KSOU), Mysore, Karnataka.
8. Netaji Subhas Open University (NSOU), Kolkata, West Bengal.
9. U.P. Rajarshi Tandon Open University (UPRTOU), Allahabad, Uttar Pradesh.
10. Tamil Nadu Open University (TNOU), Chennai, Tamil Nadu.
11. Pt. Sunderlal Sharma Open University (PSSOU), Bilaspur, Chhattisgarh.
12. Uttaranchal Open University (UOU), Haldwani, (Nainital), Uttarakhand.
13. K. K. Handique State Open University (KKHSOU), Guwahati, Assam.

Note- The Indira Gandhi National Open University (IGNOU) is only the National Open University.

1.5 KEY FEATURES OF OPEN AND DISTANCE EDUCATION

- It offers a flexible and affordable education where a variety of courses are available to choose.
- It offers a self-paced learning.
- It provides the advantages of blended mode of learning.

- It is free from age limit, and physically face-to-face interaction with the teachers, so that it a boon for working people those who want to up-skill.
- Increased freedom for both learners and educators with maintaining quality standards.
- Distance education believes on anyone, anywhere, and anytime can connect with the formal learning system without any barriers.
- Ease of use is another key feature of distance education where a user-friendly environment is available for all those involved.
- In Open and Distance Education, the learner support services are backed by powerful applications of information technology.

1.6 *ROLE OF OPEN AND DISTANCE LEARNING IN PRESENT SCENARIO*

Distance education, also called distance learning, is the education of students who may not always be physically present at a physical location called classroom. A distance learning program can be completely distance learning, or a combination of distance learning and traditional classroom learning. Today's, distance learning usually involves online education which is sometimes called hybrid or blended learning. Massive open online courses (MOOCs), offering large-scale interactive participation and open access through the World Wide Web, which is the recent educational mode in distance education. [5]

The COVID-19 pandemic resulted in the closure of the vast majority of learning centres worldwide. Almost, all learning institutions are moved to online mode of learning through different connecting platforms, i.e. Zoom, Cisco Webex, Google Classroom, Google Meet, Microsoft Teams, etc. During the COVID-19 pandemic, only distance education mode of teaching-learning becomes successful for connecting with their peers. Information and communication technology (ICT) has enabled many forms of distance learning through open educational resources and facilities such as e-learning and MOOCs. [5]

The distance education technologies are divided into two modes of delivery, i.e. synchronous learning and asynchronous learning. In synchronous learning, all learners are "present" at the same time in a virtual classroom, as in traditional classroom teaching. It requires a timetable. Web conferencing, videoconferencing, educational television, instructional television are examples of synchronous technology, as are direct-broadcast satellite (DBS), internet radio, live streaming, telephone, and web-based VoIP. In asynchronous learning, learners access course materials flexibly on their own schedules. Students are not required to be together at the same time. Mail correspondence, which is the oldest form of distance education, is an asynchronous delivery technology, as are Learning Management System, message board forums, e-mail, video and audio recordings, print materials, voicemail, and fax. [5].

1.7 *OPEN AND DISTANCE LEARNING AND TECHNOLOGY CENTRIC EDUCATION*

With the emergence and expansion of Internet, the concept of traditional education has transformed rapidly. Now, being physically present in a classroom is not the only learning option. The applications of information and communication technology in teaching-learning have opened the multiple doors of information sharing/interactive discussion.

We are living in 21st century, you can access quality education whenever and wherever you want with the help of internet. This way, totally revolutionized the traditional education system. Through online education, where you can get short duration courses as well as you may earn undergraduate and post graduate degrees which are fully offered in online mode. And, also you have a chance to join your dream institution for such courses.

Technology centric education/ online education is becoming the popular choice of youngster because it offers several benefits to the learners, such as-

- Online education enables the teacher and the learner to set their own learning pace, and there is the added flexibility of setting a schedule that fits to you.
- Studying online teaches you time management skills, which makes finding a good work-study balance easier.
- Online learning platforms offers a wide range of programs, where you can get the courses as per your choice.
- Online learning makes you accessible to the quality learning resources and also enables you to study from anywhere in the world.
- Now, online programs are accredited globally.

1.8 POINTS TO REMEMBER

- The potential of Information and Communication Technology (ICT) in education greatly facilitates the acquisition and absorption of knowledge and also increases the access of education among the aspirants.
- The ability of ICT is to transcend time and space which make it possible for asynchronous learning, where one can learn by his/her own pace.
- Today's with the access of Internet (World Wide Web), a wealth of learning resources are available in multiple forms, i.e. audio, video, animation, graphics, etc. in which almost every subject's learning material available either free (example- SWAYAM, NPTEL, NIOS, NROERs, OERs, etc) or in payment basis (example- many online learning platforms, as- byju's).
- Today's we commonly used two terms inter-changeably, i.e. Open Learning and Distance Education. They are often combined to be known as Open and Distance Learning (ODL).
- The Open and Distance Education system of study focuses on open access to education and training to make the learners free from the constraints of time and place, and offering flexible learning opportunities to individuals.

- A distance learning program can be completely distance learning, or a combination of distance learning and traditional classroom learning.

1.9 GLOSSARY

- LMS- Learning Management System.
- UGC- University Grants Commission.
- HEI- Higher Educational Institute.
- MOOC- Massive open online courses.
- VoIP- Voice over Internet Protocol.

1.10 CHECK YOUR PROGRESS

- Define Open and Distance Education in your own words.
- Explain the historical development of Open and Distance Learning in India.
- Define the role of Open and Distance Education in current scenario.

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UNIT- 2

ROLE OF TECHNOLOGY ENABLED EDUCATION IN OPEN AND DISTANCE LEARNING

2.1 INTRODUCTION

2.2 OBJECTIVES

2.3 TECHNOLOGY ENABLED EDUCATION AND OPEN AND DISTANCE
LEARNING

2.4 OPEN AND DISTANCE LEARNING GOVERNING BODIES IN INDIA

2.5 QUALITY ASSURANCE IN IN OPEN AND DISTANCE LEARNING

2.6 FUTURISTIC SCENARIO OF OPEN AND DISTANCE LEARNING

2.7 POINTS TO REMEMBER

2.8 GLOSSARY

2.9 CHECK YOUR PROGRESS

2.10 BIBLIOGRAPHY/ REFERENCES

2.11 SUGGESTED READINGS

2.1 INTRODUCTION

Distance education denotes an educational experience where the teacher and the learner are not face- to- face during the teaching and learning process (Rahman, 2014). Today's Open and Distance Learning (ODL) is highly dependent on information and communication technology (ICT), because the applications of ICT provide several mediums of information delivery, learner support services. A diverse set of ICT tools and applications are used to communicate, disseminate, store and manage information. ICT is playing a key role in ODL to meet the requirements and expectations of the learners in large scale. The use of ICT has empowered the learner's community like never before by E-mails, e-mail groups, on-line forums, webinars, web conferencing. It provides a way to connects with learner's at anytime, anywhere and to anyone. Social Networking technologies like blogs, wikis, media-sharing services and collaborative editing tools are also helpful for sharing and exchange of information between

peers. The applications of ICT's pushed a revolutionary impact on ODL system of study, because of such impacts ODL is continuously growing (Bedanta, 2020).

Education is the most important investment because is the basic need of every human being. A communication network has become an essential tool in today's educational environment than ever before where we have entered into the age of information revolution. Teaching to the distance learners requires different skills to prepare relevant and valuable learning materials (called Self Instructional Learning Material) to facilitate the construction of knowledge and learning. The global era is characterized by rapid advances in ICT and expansion of knowledge using online platforms. Basically, ICT is a tool which is used in implementing learner support services in ODL system of study education. It has been proved that ICT can improve the quality of the student learning experiences and make education and training opportunities available to a broader spectrum of the population in developing countries (Rahman, 2014).

With the advancement of ICT, a variety of audio-visuals, technology mediated broadcasts, and other internet based smart and innovative techniques are used for effective transmission of knowledge to the learners of ODL system of learning. Open and Distance Learning is the delivery of learning or training to those who are separated mostly by time and space from those who are teaching training where a variety of technology enabled teaching-learning tactics are used to transmit knowledge to the learners. ODL system of education promises the flexible learning and ICT supported smart learning model for those are unable to join the conventional system of education because of a variety of limitations (Rahman, 2014). ICT facilitates ODL system of education in several ways, as (Vasudevaiah, 2016)-

- Faster and flexible course delivery.
- Improved and increased access of education to the remote locations.
- Enhanced pedagogical and course design experience.
- Improved educational administration and monitoring.
- Enhanced collaboration and interactive experience.
- Provides several ways of preparing teaching-learning materials.
- Improved assessment system.

2.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define the role of technology supported learning in Open and Distance Learning.
- Explore governing bodies of Open and Distance Learning in India.
- Explore futuristic online and Open and Distance Learning.

2.3 TECHNOLOGY ENABLED EDUCATION AND OPEN & DISTANCE LEARNING

ICT has a power to establish communication between two physically distant locations. ICT is playing a vital role in open and distance learning to achieve the expectations of the learners. ICT provides a backbone for today's ODL system of education because ICT has proven applications for meeting the learners' requirements at various phases of learning, such as Admission, Assignment, Queries, assessment, and design and development of learning resources (Rao, n.d.). A majority of people are living in rural areas where access to the formal education system (face-to-face system of learning) is not possible, in such circumstances technology supported ODL system of education can be a good alternate to fulfill the educational needs of the society. Technologies that are used to deliver information to distance learners are often classified as two-way interactive (such as- video conferencing, WhatsApp groups, etc.) or one-way non-interactive (Such as- radio broadcasts, etc.) mediums (Shah & Salimullah, 2009).

ICT enriching the potential of ODL system of education using several connecting and information dissemination tools/applications, i.e. telephone tutoring, teleconferencing, audio, graphics, video conferencing, teletext, hypermedia (media using hyperlinks), Intelligent educational solutions, Open Educational Resources, Massive Open Online Courses, etc. ODL system of education becomes the need of today's digital era to provide educational services to the learners' using ICT supported tools (Rahman, 2014).

Barriers in Technology Enabled Education in Open and Distance Learning- There are several barriers in availing maximum benefits of ICT applications in ODL.

- Digital Literacy among society.
- Lack of availability of ICT resources.
- Lack of availability of Internet connectivity.
- Lack of technical skills to avail such educational applications.
- Lack of awareness of accessing educational facilities using various digital platforms.
- Lack of accessibility of ICT based educational resources.
- Lack of awareness of digital repositories / Courseware.
- Lack of orientation of ODL teachers.
- Lack of motivation among ODL teachers to avail ICT oriented learner support services.

2.4 ***OPEN AND DISTANCE LEARNING GOVERNING BODIES IN INDIA***

In the year 1982, Dr. B.R. Ambedkar Open University was established, as the first open university in India. This was followed by the establishment of Indira Gandhi National Open University (IGNOU) at the national level in the year 1985. The University Grants Commission (UGC), is the highest authority for regulating Open and Distance Learning (ODL) programmes

in India, although the responsibility for promotion and coordination of ODL was given to IGNOU under the Indira Gandhi National Open University Act (1985). [1]

The Distance Education Council (DEC) was set up by IGNOU in the year 1991 and it became operational in 1992. In the year 2010, the Ministry of Education (formerly known as Ministry of Human Resource Development) constituted a committee for investigating distance education standards in India. The committee recommended the creation of a new regulatory body, the Distance Education Council of India (DECI). It also recommended that until such body is established, the DEC may be shifted to UGC. [1]

In year 2013, IGNOU dissolved the DEC and the UGC took over the entire assets and manpower, establishing the Distance Education Bureau (DEB). The UGC, DEB is in the process of framing new regulations for Distance Education. Till the year 2020, two regulations have come into existence, i.e. University Grants Commission (Open and Distance Learning) Regulations, 2017; and University Grants Commission (Open and Distance Learning Programmes and Online Programmes) Regulations, 2020 (Complete links of both regulation given under “Suggested Readings”).

2.5 ***QUALITY ASSURANCE IN IN OPEN AND DISTANCE LEARNING***

Quality assurance is directly linked to academic development in terms of improving the teaching and learning skills in an ODL institutions. The few quality assurance factors which should be considered by any ODL institutions are, public accountability, improved teaching and learning, academic and administrative processes, informed student choices, and a means of continuous feedback and improvement. Such activities lead to quality educational environment, and also gives us a chance to improve our processes time to time. There are numerous reasons for quality becoming strategically important in all spheres of higher education undertakings. Some of the important reasons are indicated as- Intensifying global competition; Growing expectations; and Learners expect high quality education at minimal cost. (Ramdass, & Nemavhola, 2018).

Quality assurance from any institution satisfy the needs and aspirations of the learners in a appropriate level of delivery of services. There are many factors that may be considered for the improvement of the management strategy of distance education programmes in order to achieve higher quality. as- (Kihwelo, n.d.)

- Admission requirements and procedures.
- Development and production of Self-Instructional Learning Material.
- Structure and management of the delivery system.
- Student assessment procedures.

- Quality of materials used for teaching and promotion of learning.
- The student support services.
- Problem of assessment of the effectiveness of an individual learner.
- Monitoring, evaluation and feedback mechanisms.
- availability of adequate human and material resources for the operation of the ODL programmes.

2.6 ***FUTURISTIC SCENARIO OF OPEN AND DISTANCE LEARNING***

There is no doubt, that the future education is strongly based on the pillars of online and Open and Distance Learning. We have seen during the Covid-19 pandemic that the online learning revives the world education system.

Several arguments are associated with online and Open and Distance Learning, such as- Accessibility, affordability, flexibility, learning pedagogy, life-long learning opportunities, etc. The online mode of learning is easily accessible and reachable to the rural and remote areas. It is considered to be a relatively cheaper mode of education in terms of the lower cost of and easy accessibility of learning resources. Flexibility is another interesting aspect of online and open and distance learning; a learner can schedule or plan according his/her own pace for completion of courses. Such type of learning environment can increase the learning potential of the learners in near future. With the help of such futuristic learning environments, the learners can learn anytime and anywhere, by utilizing online learning resources, so that one can develop new skills and habits of life-long learning (Dhawan, 2020).

The following key transformations are noted with regards to online and open and distance learning, as-

- Student support system transformed into ICT-based student support.
- Printed Self Learning Materials (SLMs) transformed into online learning resources, i.e. e-books, podcasts, etc.
- Face-to-Face counselling transformed into Four-Quadrant-based Support, i.e. e-tutorial/e-content,
- web resources, discussion forum and self-assessment;
- Training and capacity building programs transformed into online programmes/courses/Webinars/short online courses.
- Paper based assignment transformed into Online assignments.

Challenges of online learning-

- Internet access for everyone.
- Infrastructure.
- Awareness towards online learning.
- Motivation.

2.7 POINTS TO REMEMBER

- Distance education denotes an educational experience where the teacher and the learner are not face- to- face during the teaching and learning process.
- Open and Distance Learning is the delivery of learning or training to those who are separated mostly by time and space from those who are teaching training where a variety of technology enabled teaching-learning tactics are used to transmit knowledge to the learners.
- The use of ICT has empowered the learner's community like never before by E-mails, e-mail groups, on-line forums, webinars, web conferencing.
- ICT enriching the potential of ODL system of education using several connecting and information dissemination tools/applications, i.e. telephone tutoring, teleconferencing, audio, graphics, video conferencing, teletext, hypermedia (media using hyperlinks), Intelligent educational solutions, Open Educational Resources, Massive Open Online Courses, etc.

2.8 GLOSSARY

- SILM- Self Instructional Learning Material.
- ODL- Open and Distance Learning.
- DEC- Distance Education Council.
- DEB- Distance Education Bureau.

2.9 CHECK YOUR PROGRESS

- a) How Open and Distance learning is supported by the ICT? Explain.
- b) Define the governing bodies of open and distance learning in India.
- c) Why quality assurance is required in open and distance learning system of education?
- d) Explain the futuristic scenario of online and open and distance education.

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UNIT- 3

AN INTRODUCTION TO AUDIO AND VIDEO EDITING TOOLS

3.1 INTRODUCTION

3.2 OBJECTIVES

3.3 ROLE OF AUDIO AND VIDEO IN TEACHING LEARNING

3.4 POPULARLY USED OPEN-SOURCE TOOLS FOR EDITING

3.5 HARDWARE SOFTWARE REQUIREMENT FOR AUDIO AND VIDEO EDITING

3.6 OVERVIEW OF AUDACITY AUDIO EDITING TOOL

3.7 OVERVIEW OF OPENSHOT VIDEO EDITING TOOL

3.8 POINTS TO REMEMBER

3.9 GLOSSARY

3.10 CHECK YOUR PROGRESS

3.11 BIBLIOGRAPHY/ REFERENCES

3.12 SUGGESTED READINGS

3.1 INTRODUCTION

Video Editing is a technical and artistic process in which a group of video material (Footage) is compiled or altered from its original to create a new version which is more audience oriented. In other words, Video editing is the process and technique of working with video images to produce a complete piece of attractive information.

During COVID 19 global pandemic, the role of educational videos in each level of learning is in high demand. It can be used to connect virtually with students, provide feedback, and assign homework in a clear and detailed manner. Videos provides a way of personalized learning experience. Educational videos are very popular and becoming an increasing demand for virtual learning.

In video editing activating a great cut point is the most challenging task. In editing process, the editor learns to perform the best editing methods and best processes which is decided by the editor. The duration of the shooting, the angle of the camera, the color composition of the scene, method to find the best place for the filter and transition altitude, etc are the key things which are decided by the editor itself.

For becoming more technical about video editing, one should have the knowledge of machine's hardware, software, and tools which are dedicatedly used for editing. Several technical terms are frequently used in the area of video/audio editing, as- layout interphase, filter, version, kind of the transition, motion, effect, key framing, color correction, audio modification, audio filter, codec setting, capturing and rendering, etc.

3.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define the role of audio and video in teaching-learning.
- Explore Open-Source tools for audio video editing.

3.3 ROLE OF AUDIO AND VIDEO IN TEACHING LEARNING

In modern days classroom teaching, the role of audio-visual aids in teaching-learning is helpful for the learners to develop well understanding of the subject related complex concepts. If the teachers choose to integrate instructional videos in between their lectures, it would not only facilitate the learning process but would also makes teaching joyful. The use of internet-based smart devices enables the learners to grasp these concepts quickly and easily. Such technological advancements, make the job of teachers easier than ever. While using such teaching aids, teachers also should be aware of harms involved with this methodology of teaching. Relying too much on technology can make some difficulties for achieving target learning outcomes. Any kinds of teaching aids should only be used for assistance, so that one can make interesting class environment.

There have been continuous developments of audio technology, from audio-cassettes to modern smart phone-oriented podcasts, the pedagogical characteristics of audio have remained remarkably constant over a fairly long period. Although audio can be used on its own, it is often used in combination with other media, particularly text. The audio can be used to present Spoken languages for practice; Music, either as a performance or for analysis; and Interviews with leading researchers or experts. Because of the ability of the learner to stop and start recorded audio, it has been found to be particularly useful for enabling students through repetition and practice to master certain auditory skills (e. g. language pronunciation, analysis of musical structure, etc). [1]

Videos are particularly helpful for- [2]

- To demonstrate experiments where equipment or phenomena to be observed are large, microscopic, expensive, and inaccessible;
- Where resources are scarce, or unsuitable for student experimentation;
- Where the experimental design is complex;
- Where the experimental behaviour may be influenced by uncontrollable but observable variables;
- Illustrate principles involving dynamic change or movement;
- Illustrate abstract principles through the use of specially constructed physical models;
- Illustrate principles involving three-dimensional space;
- Demonstrate changes over time through the use of animation, slow-motion, or speeded-up video;

Strengths of videos in teaching- [2]

- Linking concrete events and phenomena to abstract principles and vice versa;
- The ability of students to stop and start, so that they can integrate activities with video;
- Providing alternative approaches that can help students having difficulties in learning abstract concepts;
- A growing amount of freely available, high quality academic videos;
- Good for developing some of the higher-level intellectual skills and some of the more practical skills needed in a digital age;
- The use of low-cost cameras and free editing software enables some forms of educational videos to be easily produced.

Weaknesses of videos in teaching- [2]

- Faculty unawareness and unwillingness to use videos in teaching.
- To maintain quality educational videos is a challenge.
- Creating original material that exploits the unique characteristics of video is time-consuming, and still relatively expensive.

3.4 POPULARLY USED OPEN-SOURCE TOOLS FOR EDITING

[1] Blender (www.blender.org)-

It is powerful open-source tool for 3D creation, modelling, sculpting, rendering, animation, video editing, game creation, and etc. You may download it from the given URL, as- blender.org.

[2] Kdenlive (www.kdenlive.org)-

It is a powerful video editing tool having a user-friendly drag-and-drop-based user interface. You may download it from the given URL, as- kdenlive.org.

[3] OpenShot (www.openshot.org)-

OpenShot is a free and open-source video editor for Linux, macOS, and Windows. It is user friendly tool for beginners. You may download it from the given URL, as- openshot.org.

[4] Shotcut (www.shotcut.org)-

It is a free and open-source, cross-platform video editing software for FreeBSD, Linux, macOS and Windows. You may download it from the given URL, as- shotcut.org.

[5] Audacity (www.audacityteam.org)-

Audacity is a free and open-source, user-friendly tool for digital audio editing and recording application software. It can be used for Windows, macOS, and Linux. You may download it from the given URL, as- audacityteam.org.

[6] VidCutter ()-

It is a free, open source, cross-platform video editing tool that allows you to perform various cut related actions to audio and video files. it supports Windows, MacOS and Linux OS.

[7] Pitivi (www.pitivi.org)-

Pitivi is an open-source video editing tool. You may download it from the given URL, as- pitivi.org.

[8] Cinelerra (www.cinelerra.org)-

It is a popular open-source video editor with several features, i.e. advanced timeline, motion tracking support, video stabilization, colour correction, etc. You may download it from the given URL, as- cinelerra.org.

Note- If you want to download more open-source applications for different purposes, you may visit to “[www. sourceforge.net](http://www.sourceforge.net)”; and you can make a search query as per your need.

3.5 ***HARDWARE SOFTWARE REQUIREMENT FOR AUDIO AND VIDEO EDITING***

Basically, today's digital computers are well equipped with all such minimum features through which one can start editing of a at beginner's level. However, some guidelines are given for the minimum hardware/software requirement of audio and video editing, as-

- Memory (RAM)- 4 to 32 GB (ideally at minimum 8 GB).
- Processor- multi-core Intel i5/i7/i9 preferably with 4 or more processor cores.
- Storage- at least 256 GB hard disk drive (preferably SSD).
- Graphics Card- This is dependent on the editing software. Preferably AMD and NVIDIA. (Minimum 2 GB)

- Operating System- Windows 7 or advance (64 bit), Mac OS X, Linux, etc.
- Screen size- larger screen size preferred (Minimum 17 to 21 inches).

Note- A working computer system with speaker and web cam is required, and it also should fulfill the above requirements.

3.6 OVERVIEW OF AUDACITY AUDIO EDITING TOOL

Here, we are giving brief overview of “Audacity” an audio editing tool. The basic operations you can perform with the Audacity, as- [3]

- Record, Play and Edit.
- Saving your work in desired audio formats.
- Customizing Audacity- themes, colors, preferences, layout and plug-in extensions.
- You can utilize shortcuts and Macros for faster editing process.
- Changing the loudness of your audio- fades, Amplify, pan and gain.
- You can manage the noise in your audio- reducing, adding, fine tuning.
- Navigation and changing speed and pitch, etc.

Toolbars provide quick access to many functions in Audacity. In some cases, the functions provided by a toolbar are available only through that toolbar. If your desired toolbar is not visible, choose View -> Toolbars and click to put a checkmark by the toolbar you wish to enable. [3]

The Meter toolbars are a special case. You may have one or both of the separate Recording and Playback Meter toolbars visible (both are visible by default). Alternatively, you can have only the Combined Meter toolbar visible (which displays recording and playback levels in a single meter). The tooltips for the toolbars and tools (visible when hovering over the toolbar or tool) will display the shortcut for that tool/toolbar if one is set. [3]

For more details, you may follow the following help manual of Audacity, as- <https://manual.audacityteam.org/#tutorials>.

3.7 OVERVIEW OF OPENSHOT VIDEO EDITING TOOL

Here, we are giving brief overview of “OpenShot” a video editing tool. The basic features of OpenShot are as-

- It is available for cross-platforms (Supports Linux, OS X, and Windows).
- Support for many videos, audio, and image formats.
- Supports curve-based Key frame animations.
- Desktop integration (drag and drop support).
- Supports unlimited tracks / layers.
- Supports clip resizing, scaling, trimming, snapping, rotation, and cutting.

- Supports compositing, image overlays, and watermarks.
- Supports title templates, title creation, sub-titles.
- Supports 2D animation (image sequences).
- Supports 3D animated titles and effects.
- SVG (Scalable Vector Graphics) friendly.
- Advanced timeline (including Drag & drop, scrolling, panning, zooming, and snapping).
- Frame accuracy (step through each frame of video).
- Supports time-mapping and speed changes on clips (slow/fast, forward/backward, etc.).
- Supports audio mixing and editing.

For more details, you may follow the following help manual of “OpenShot” open-source video editing tool, as- www.openshot.org/user-guide.

3.8 POINTS TO REMEMBER

- Editing is a process. Editing is usually done in layers; determine which layer you need to start with by determining what the base is.
- After a long editing session your brain can start to get muddy and tired, you must take a short break.
- There are a lot of rules for traditional editing. Sometimes, breaking these rules can lead to some great consequences for your audience. You should have a good grasp of those rules, if you know when it makes sense to deviate, it will be good for you.
- Do not get too carried away in your videos and also not to expect from your audience.

3.9 GLOSSARY

- Capture - Digitizing raw footage onto your computer for use digitally in editing.
- Batch Capture - Capturing a number of clips all at one time using in and out marks from a log sheet.
- Logging - Marking a series of In and Out points in a clip to signify which parts should be captured.
- Cutting - The cut of editing video.
- Slide (Slip) - A type of edit which keeps the same length of the clip but changes the in and out points to make it start and end earlier or later.
- Roll (Trim) - A type of edit those changes just the pin point or the out point and also makes the clip longer or shorter.
- Frame - A measurement of time, and also the smallest amount a video can be cut to.

- Frame Rate - The number of frames that will make one second of video this can range to any number. Common frame rates are 60, 30, 29.97, 25, 24, 23.98, 16.
- Mark In - Placing a marker at the beginning of where you want your clip to start.
- Mark Out - Placing a marker at the beginning of where you want your clip to end.
- Edit - To make a cut in a clip making it a separate clip.
- Transition - An effect which visually moves your video from one clip to another. There are many types of transitions.
- Keyframe - A marker that locks in a Parameter for a specific property. Changing keyframes over time will animate the video or change properties over time.
- Sequence (Timeline) - Where all the cuts take place, a place to lay out clips.
- Levels - The amount of loudness the audio of a clip or sequence will have this ranged from -infinity db. to 0 db.
- Title Safe - An area within the viewable space of your screen in which text will be able to be seen safely on a TV set at home. Usually, 20% from the side of the viewer.
- Action Safe - An area within the viewable space of your screen in which the video will be able to be seen safely on a TV set at home. Usually, 10% from the side of the viewer.
- Bit- A measure of quantity of data. A bit is one binary digit, a 0 or a 1.
- Bit Rate- The number of computer bits conveyed or processed per unit of time. Normally expressed in kilobits per second (kbps).
- dB- Decibels. A logarithmic unit (typically of sound pressure) describing the ratio of that unit to a reference level.
- Dither-Intentional noise which is added so as to randomize the quantization errors (rounding errors) that occur when down sampling the Bit depth of an audio stream to a lower resolution than the current format.
- Lossless- A format that does not lose any information. It may be either a size-compressing format like FLAC where the quality is exactly as good as before compression, or an uncompressed format like WAV.

3.10 CHECK YOUR PROGRESS

- a) Define the role of audio and video in modern day teaching-learning.
 - b) List some popular open-source tools for audio and video editing.
 - c) List the hardware/software requirements for audio and video editing.
 - d) How videos are helpful for teaching-learning? Explain.
-

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- <https://itsfoss.com/open-source-video-editors>.

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- <https://www.openshot.org/user-guide>.
- <https://manual.audacityteam.org/#tutorials>.

UNIT- 4

VIDEO CONFERENCING

4.1	INTRODUCTION
4.2	OBJECTIVES
4.3	APPLICATIONS OF VIDEO CONFERENCING
4.4	H/W & S/W REQUIREMENTS FOR VIDEO CONFERENCING
4.5	STEP BY STEP CONFIGURATION FOR VIDEO CONFERENCING
4.6	TOOLS USED FOR VIDEO CONFERENCING
4.7	VIDEO CONFERENCING VENDORS
4.8	WORKING OF VIDEO CONFERENCING
4.9	POINTS TO REMEMBER
4.10	GLOSSARY
4.11	CHECK YOUR PROGRESS
4.12	BIBLIOGRAPHY/ REFERENCES
4.13	SUGGESTED READINGS

4.1 INTRODUCTION

The Video conferencing also known as video teleconference. In Video conferencing the pair of hardware/software interacts with each other. They simultaneously transmit and receive video and audio signals from the different geographic locations. In Video conferencing you can share:

- documents,
- presentation materials,
- whiteboards,
- flip charts and
- Visual aids etc.

The Video conferencing is often used at the corporate or enterprise level. The Video conferencing is also different from video phone calls. Video conferencing is sometime known as online video conferencing or PC video conferencing. The invention of the television assisted

the Video conferencing. The two devices are connected by coaxial cable or radio transmission. Following are some milestones of Video Conferencing:

- In 1961 the NASA used video conferencing in the first manned space flight. This time two radiofrequency links used one in each direction. The TV news channels also used the same technology. They used it for reporting from distant locations. They use trucks with mounted satellite dishes and these trucks provide mobile links for video conference transmissions. Initially this technology was very expensive. That time it was not used for business, education or telemedicine.
- After 1980s, digital telephony becomes very popular. It is available using compressed video and audio transmissions.
- After 1984 the first video conferencing systems sold commercially by PictureTel Corp.
- During the 1990s, very reasonable and cost-effective video conferencing comes in the market.
- The IP-based video conferencing became possible after 1990s.
- In the Winter Olympics of 1998, the video conferencing is used. Nagano, Japan, used this technology in the opening ceremonies. Around five continents are appeared in real time.
- After 2000s, video conferencing became available at very reasonable costs using Internet connection. (Source: <https://www.techopedia.com/definition/1791/videoconferencing>)

Always the Video conferencing is live, and it has visual connection between the devices. Two or more remote person can interact over the internet. They can perform face-to-face meeting over internet. It is very important. It can help to join people. If person cannot meet physically then it can provide online or virtual face-to-face connection. Video conferencing can transmit of static images and text between two devices. It can also transmit full-motion video images and high-quality audio. In today's scenario the web conferencing and cloud-based virtual meeting room services are very popular. It enables organizations or companies to deploy video conferencing with minimal infrastructure investment or cost.

How video conferencing works?

There are two steps of video conferencing: Compression and Transfer.

Compression phase- During the compression step, the webcam and/or microphone capture analog audio-visual (AV) images or input. This data collected is in the form of continuous waves of frequencies. It can also be amplitudes. This collected data may represent the captured sounds, colors, brightness, depth and shades. This data should be transferred over a normal network. Therefore, it requires some code. This code used to compress the data into digital packets. Finally, this enables the captured audio-visual fast transfer over broadband or Wi-Fi internet. (Source: <https://www.techopedia.com/definition/1791/videoconferencing>)

Transfer phase: During the transfer step, the digitally compressed data is sent over the digital network to the receiving computer. After reaching the endpoint, another program decompresses the data. This program converts it back into analog audio and video due to this the receiving screen or speakers correctly view and hear the audio-visual (AV) data. (Source: <https://www.techopedia.com/definition/1791/videoconferencing>)



Figure 4.1 Video Conferencing Demonstration¹

¹ (Image Source: <https://media.istockphoto.com/vectors/business-people-video-conferencing-vector-id509256686?k=6&m=509256686&s=612x612&w=0&h=TB5F7fUyWz3jkXQIlaHLYVu4X97oqzsDDVU0D74MG90=>)

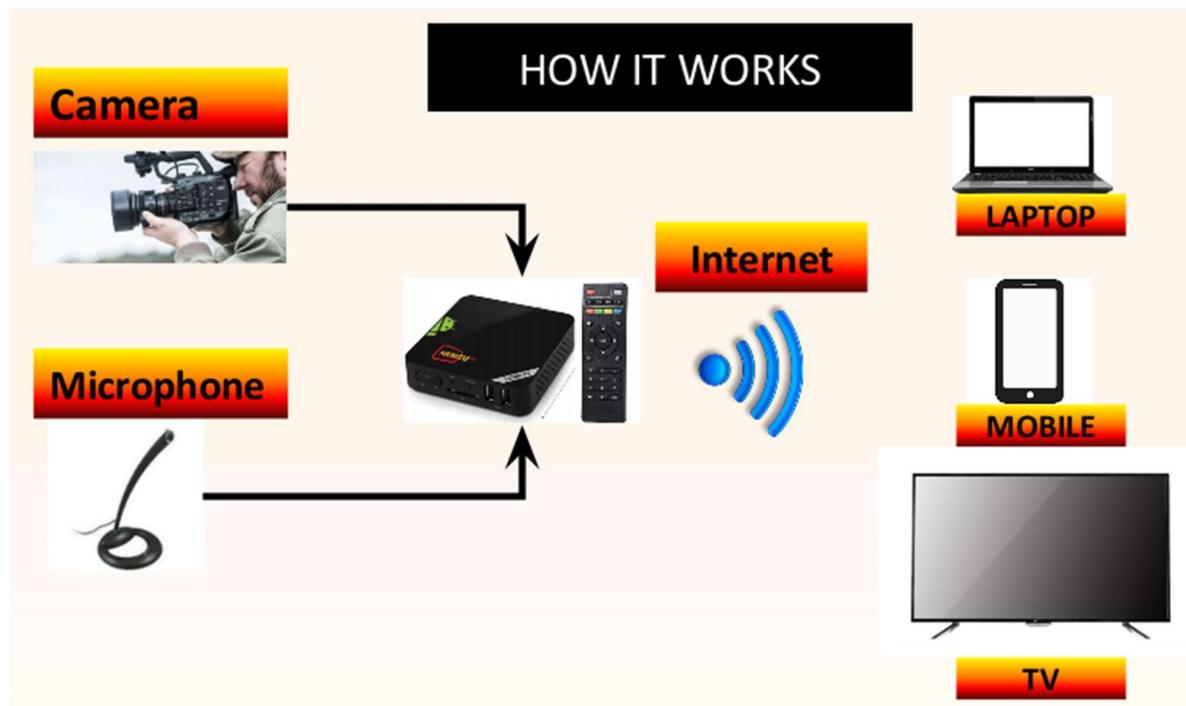


Figure 4.2 How video conferencing works?²

Components of video conferencing systems-

Following are some major components of a video conferencing system:

- It requires a network for data transfer. This network should require a high-speed broadband internet connection. It also uses voice over Internet Protocol (VoIP) technology. Sometime the Local area network (LAN) and Integrated Services Digital Network (ISDN) connections can also be uses.
- Requires more than two video cameras/webcams which provide video input.
- Requires more than two microphones – it may be an external microphone/built in microphone.
- Requires computer screen/monitor/TV/projector. These devices can broadcast video output.
- Requires Headphones/laptop speakers/external speakers can be used for audio output.
- Requires Hardware- or software-based coding and decoding technology. It can compress Audio Video (AV) data into digital packets. It can decompress the data at the other endpoint.

² (Image Source:<http://blynkmedia.com/wp-content/uploads/2017/05/Mungucast-how-it-works-1.png>)

- The Acoustic echo cancellation (AEC) software can be used. It reduces audio delays. It can also support real-time communication. (Source: <https://www.techopedia.com/definition/1791/videoconferencing>)



Figure 4.3 How video conferencing works?³

Video conferencing and remote working-

Video conferencing is very useful for remote workers. The worker can perform their work-related meetings. These remote workers can also do work from home. The Work from home sometime better than the companies' traditional office spaces. The video conferencing can also provide face-to-face contact between two person/members/colleagues. Video conference consists screen sharing, video calls or voice communications.

Now Video conferencing provides better communication and productivity. It can also provide co-working relationships. It can effectively engage co-worker in hearing voices on phone or correspondence via email. Situation like COVID-19 pandemic the remote working is very important. It is very important for the companies who are looking video conferencing technologies to maintain business operations remotely. To follow the social distancing protocol, video conferencing is really very important. However, the closest approximation is an actual, face-to-face meeting. It is very much beneficial for intraorganizational meetings. The

³ (Source: <https://image.slidesharecdn.com/video-conferencing-fundamentals-and-application282/95/video-conferencing-fundamentals-and-application-6-728.jpg?cb=1271304404>Video conferencing vendors)

video conferencing also been useful for job candidate interviews, in place of physical face to face interviews.

Zoom, Webex Meet, Meet etc. are a widely popular video conferencing vendor. There is explosive growth in video conferencing in 2020 due to the Covid-19 pandemic. Now the Zoom has become eponymous for video conferencing. The user interface (UI) of Zoom is very well. It is free for the users. Users can conference for up to 40 minutes long and 100 users each at a time. (Source: <https://www.techopedia.com/definition/1791/videoconferencing>)

Importance of Video Conferencing-

There are many benefits of video conferencing. It can increase productivity among employees. It is very useful for businesses. It provides a very improved way of communication. You can interact with colleagues, partners and customers with video conferencing.

Video conferencing is very cost effective you can reduce travel costs during employee training, meeting, project demonstration, client meeting etc. The hidden benefits of video conferencing have to conduct more efficient meetings. In these meeting we can exchange nonverbal communications and a stronger sense of community among business contacts. It can happen between companies, as well as with customers. In video conference the face-to-face connection adds nonverbal communication to the exchange. It helps participants to develop a stronger sense of familiarity with individuals.

(Source: <https://www.techopedia.com/definition/1791/videoconferencing>)

4.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Explore the applications of Video Conferencing.
- Know the Hardware Software requirements for Video Conferencing.
- Explore the steps of configuring Video Conferencing.

4.3 APPLICATIONS OF VIDEO CONFERENCING

Following are the applications and benefits of using video conferencing for your organization

- a) Enable Digital Workforce
 - b) Simplify the Management and Usability
 - c) Communication and Culture
 - d) Increased Communication Reliability
 - e) Improve Value and Reduce Redundancy
-
- **Enable Digital Workforce-** The Video conferencing software creates a collaborative meeting culture in your company. It is a strong foundation for enabling this new generation digital workforce. Always the Video meetings/conference help teams to

maintain human connections, irrespective of their physical location. It gears up decision making as well as improves our capability to collaborate internationally.

- **Simplify the Management and Usability-** The groups or Teams collaborates through audio conferencing, video conferencing, screen sharing and real-time instant messaging. Always the video conferencing makes communicating very easy.
- **Communication and Culture-** The prioritizes of new generation is mobility, flexibility and modern forms of communication over offices. The Video conferencing bringing remote workers face-to-face with in-office employees. It can boost productivity on both ends. It can also lower travel costs at the same time. The travel costs of offline meeting is very high. The video conferencing is obviously very cost effective. When company is building the remote employees then it is very useful. The video conferencing has the unique ability to bring the human connection. It is online face-to-face communication. Today we have video-first culture and really it improves communication.
- **Increased Communication Reliability-** Video conferencing often provides a fast and secure way to communicate with each other. Video conferencing also increases communication reliability.
- **Improve Value and Reduce Redundancy-** Companies are now upgrading their audio or web conferencing. The video conferencing provider vender companies now providing enhanced quality solutions like audio conferencing, screen sharing, chat, meeting recording and event live streaming etc. (Source: <https://www.lifesize.com/en/resources/guides/video-conferencing-advantages-benefits>)

4.4 *H/W & S/W REQUIREMENTS FOR VIDEO CONFERENCING*

Video Conferencing Hardware Requirements:

- **Camera-** The main hardware requirements of video conferencing system is the Web camera. It mainly required to record a video signal which sent to people on the other side of the live session of video conference. Big businesses house particularly need high-definition (HD) conferencing web cameras. It comes with advanced camera features like remote control pan, tilt and zoom. Sometime in medical applications or in educational conferences, the participants may need to use more cameras to ensure better clarity. By using the HD cameras participants enjoy the highest resolution and big images.

- **Codec Unit-** The important hardware used for video conferencing is the CODEC (coder-decoder). This CODEC compress audio and video feed, and then transmit it through an IP network. It also decompresses or expands incoming audio and video stream and maintains the network's data link.



Figure 4.4 Various Video Conferencing tools.⁴

- **Video Display-** The monitor display for live video conference sessions. LCD, HD Plasma display, LDP Projector and XGA PC Type Display are the most common video conferencing displays. Most of the company likes high-definition (HD) displays ranging between 720p and 1080p. This HD display provides the good resolution and it also offers extra viewing space. While the standard monitor devices provide less space.
- **Microphone and Speakers-** The Microphone and audio subsystems are also an important part of for video conferencing hardware. Participants need microphones or headsets to communicate with other attendees at the time of the live session. It should be digital microphones with integrated software and these collaborative microphones can be used in large group interactions. Microphones used in video conferencing can also provide instant connectivity. It can also cancel any background echoes.

Software Used for video conferencing

⁴ Image Source: <https://img.eztalks.com/video-conference/support-multiple-vc-software.png>

- **Desktop End-Point Software-** The desktop endpoint applications or browser-based interfaces are software that provides access to instant video conferencing. This type of software used for video conferencing. Audio system work with integrated microphones, speakers and other USB-connect devices. The ezTalks and Lifesize are video conferencing providers. They have their own software for video conferencing. Their software is fully compatible with Windows, Mac, iOS and Android. Firefox and/or Chrome to support video conferencing.
- **Broadband Internet Access-** A high-speed internet service required for high quality video conferencing streaming. The broadband modem can have the huge bandwidth. This is helpful for running live conferencing sessions. To ensure smooth instant streaming stable internet connectivity is required. For video conferencing routers can also be fitted in the offices for establishing internet access in computers or mobile.
- **Mobile Apps-** Different Mobile applications can enable meeting attendees to participate in video conferences via their smartphones, tablets or iPads etc. as per their availability.
- **Web Conference Software used for video conferencing-** Video conferencing software facilitate VoIP (Voice over Internet Protocol) communication. These software also allow for video streaming, application sharing and private text chats. Many video conferencing software can have record and playback ability, whiteboards, instant messaging and inbound faxing.

(Source: <https://www.eztalks.com/video-conference/hardware-and-software-requirements-for-video-conferencing.html>)

4.5 ***STEP BY STEP CONFIGURATION FOR VIDEO CONFERENCING***

Video conferencing also be used for video training. This is powerful and cost-effective methods for delivering the professional education. Following are some steps to Better Video Conferencing:

Step 1 Test everything- The equipment should be tested with your colleagues prior to your conference. Following points should also be considered:

- Make sure that the software well enough and confidently manage the meeting
- Ensure that hardware should be all functional
- Video display should be proper
- Sound quality and volume is sufficient or not
- Internet speed should be fast enough to handle the video
- Headphones and microphones, should be functional
- You should also practice with screen sharing software

Step 2 Prepare the conference room- Video conferencing should be with proper lighting. Sunlight can cause unexpected issues. Diffused light should be there in place of direct light for video quality. The conference room size or meeting will decide the type of microphone to be used.

Step 3 Control what will be captured on camera- The Bare walls, painted a subdued colour are the best backgrounds for video conferences.

Step 4 Dress the part- You can participate in video conferencing from home, the beach, or the corporate headquarters, but you should be dressed professionally.

Step 5 During the Call, Follow Proper Communication Etiquette

- Take some time for introductions so that everyone can be connected.
- When you're not speaking mute your mic. It will help to eliminate distracting background noise.
- Avoid activity like tapping pens, shuffling papers, etc. It might be amplified by your mic.
- Focus into your camera at the time when you're speaking. So that others participant feel that you're communicating to them.
- You can send your location prior to speaking.

Step 6 Speak clearly- Be sure that you are speaking clearly. Also confirm that your equipment is working properly or not. Do not shout into your microphone. Be patient when beginning to speak. Do not speaking over another. Be sure to introduce yourself each time when you speak.

Step 7 Be organized- Before the video meeting you should have a clear agenda for talking. You should also know the purpose of your video conference.

Step 8 Have a backup plan- The electricity backup is very important. So you should have a electricity backup plan.

Finally, Video conferencing an important and integral part of every company. (Source: <https://franchetti.com/8-steps-to-better-video-conferencing/>)

4.6 TOOLS USED FOR VIDEO CONFERENCING

The Video conferencing is growing very rapidly. Now it becomes an essential tool for connecting remote employees. During the COVID-19 pandemic it has led to unprecedented growth. It has been seen that the record numbers of downloads for video conferencing apps. Now we have lots of good video conferencing tools available. They offer extensive features. We can integrate them with enterprise software suites. Following are some video conferencing tools. (Source: <https://www.jotform.com/blog/video-conferencing-tools/>)

The Best Free Video Conferencing Tools

- Zoom
- Google Hangouts

- UberConference
- TrueConf Online
- Skype
- FreeConference
- Lifesize Go
- Slack Video Calls
- Facebook Live
- YouTube Live

(Source: <https://www.owllabs.com/blog/video-conferencing-tools>)

4.7 VIDEO CONFERENCING VENDORS

The video conferencing Application like Zoom, Webx Meet, JioMeet, GoToMeeting, Meet, Apple's FaceTime, Google's Chat and Microsoft's Skype. By these applications the video conferencing ubiquitous can be very easily used on desktops and mobile devices. These devices must have an embedded camera. The Facebook also introduced Workplace Rooms, for video conferencing service.

(Source: <https://www.techopedia.com/definition/1791/videoconferencing>)

Following are some video conferencing vendors and products:

Angekis	ZTE	ScanSource
Cisco Webex	PGi	RingCentral
Avaya	Konftel	GoToMeeting
Mitel	Jenne	Adobe Connect
Lifesize	Poly	Blackboard Collaborate
Logitech	West	Fuze

4.8 WORKING OF VIDEO CONFERENCING

There are some easy steps how to Video Conferencing Works. The company like retail and finance to healthcare, education and the corporate world, getting the benefits of video conferencing by remote communication. Following are some points on, how video conferencing works:

- Two or more people communicate through audio and video.
- Two people communicate with each other remotely through the following: (i) A computer with a webcam and speakers or a telephone; (ii) An internet connection

In Video conferences we can include hundreds of people. Video conferences require software and web page and internet communication tools enable streaming audio and video, instant messaging, etc. The end user can communicate via mobile devices, laptops, tablets and even smartphones or digital screens.

- AV input is converted to digital data.
When end users communicate, the video input from the camera and audio input from the microphone are converted from analog to digital by video conferencing software.
- The digital video and audio are compressed.
There are some Special compression software of video and audio data, so that the data move faster over Wi-Fi or broadband internet.
- The video and audio data reaches its destination.
When the digital data arrives at the other endpoint, then the software decompresses it. It converts it to original size and converts it back to analog.
- Ideally, the listener clearly sees and hears the content.
Most video conferencing software ensures that the audio and video are as clear as possible, also including acoustic echo cancelation. This removes sound interference. It means that overlapping speech from the other user. It also eliminates any sound delays. In this new era customers expect a better and smooth video conferencing. They also want to invest too significantly. (Source: <https://imagine.next.ingrammicro.com/ucc/how-video-conferencing-works-in-5-easy-steps>)

NOTE-

Video conferencing is very important in this new era. This is next generation technology. There are many video conferencing hardware and software requirements. We have discussed many of these but new tools and technologies are replacing them. This is especially beneficial for a small business. Sometime new technological components can cost you extra money but it will pay off in the long run. We can lead and face the competition. For a stable video conferencing system, we have to ensure efficient communication. Investing in hardware and software for video conferencing is really worthwhile. Again, the video conferencing is one of the future technologies. By implanting video conferencing, we can improve productivity and reduce costs.

4.9 POINTS TO REMEMBER

- In Video conferencing the pair of hardware/software interacts with each other. They simultaneously transmit and receive video and audio signals from the different geographic locations.
- In Video conferencing you can documents, presentation materials, whiteboards, flip charts and Visual aids etc.
- In 1961 the NASA used video conferencing in the first manned space flight. This time two radiofrequency links used one in each direction. The TV news channels also used the same technology. They used it for reporting from distant locations. They use trucks with mounted satellite dishes and these trucks provide mobile links for video conference

transmissions. Initially this technology was very expensive. That time it was not used for business, education or telemedicine.

- In the Winter Olympics of 1998, the video conferencing is used. Nagano, Japan, used this technology in the opening ceremonies. Around five continents are appeared in real time.
- Video conferencing can transmit of static images and text between two devices. It can also transmit full-motion video images and high-quality audio.
- In today's scenario the web conferencing and cloud-based virtual meeting room services are very popular. It enables organizations or companies to deploy video conferencing with minimal infrastructure investment or cost.
- The video conferencing Application like Zoom, Webx Meet, JioMeet, GoToMeeting, Meet, Apple's FaceTime, Google's Chat and Microsoft's Skype. By these applications the video conferencing can be very easily used on desktops and mobile devices. These devices must have an embedded camera. The Facebook also introduced Workplace Rooms, for video conferencing service.
- Situation like COVID-19 pandemic the remote working is very important. It is very important for the companies who are looking video conferencing technologies to maintain business operations remotely.
- The Video conferencing software creates a collaborative meeting culture in your company. It is a strong foundation for enabling this new generation digital workforce. Always the Video meetings/conference help teams to maintain human connections, irrespective of their physical location. It gears up decision making as well as improves our capability to collaborate internationally.
- The Video conferencing Bringing remote workers face-to-face with in-office employees. It can boost productivity on both ends. It can also lower travel costs at the same time. It is online face-to-face communication. Today we have video-first culture and really it improves communication.

4.10 GLOSSARY

- **Video conferencing-** Always the Video conferencing is live, and it has visual connection between the devices. Two or more remote person can interact over the internet. They can perform face-to-face meeting over internet. It is very important. It can help to join people. If person cannot meet physically then it can provide online or virtual face-to-face connection.
- **Video Compression-** During the compression step, the webcam and/or microphone capture analog audio-visual (AV) images or input. This data collected is in the form of

continuous waves of frequencies. It can also be amplitudes. This collected data may represent the captured sounds, colors, brightness, depth and shades. This data should be transferred over a normal network. Therefore, it requires some code. This code used to compress the data into digital packets. Finally, this enables the captured audio-visual fast transfer over broadband or Wi-Fi internet.

- **Video Transfer-** During the transfer step, the digitally compressed data is sent over the digital network to the receiving computer. After reaching the endpoint, another program decompresses the data. This program converts it back into analog audio and video due to this the receiving screen or speakers correctly view and hear the audio-visual (AV) data.
- **Zoom-** Zoom, Webex Meet, Meet etc. are a widely popular video conferencing vendor. There is explosive growth in video conferencing in 2020 due to the Covid-19 pandemic. Now the Zoom has become eponymous for video conferencing. The user interface (UI) of Zoom is very well. It is free for the users. Users can conference for up to 40 minutes long and 100 users each at a time.
- **Audio or web conferencing-** Companies are now upgrading their audio or web conferencing. The video conferencing provider vendor companies now providing enhanced quality solutions like audio conferencing, screen sharing, chat, meeting recording and event live streaming etc.
- **Video conferencing Camera-** The main hardware requirements of video conferencing system is the Web camera. It mainly required to record a video signal which sent to people on the other side of the live session of video conference. Big businesses house particularly need high-definition (HD) conferencing web cameras. Sometime in medical applications or in educational conferences, the participants may need to use more cameras to ensure better clarity.
- **Codec Unit-** The important hardware used for video conferencing is the CODEC (coder-decoder). This CODEC compress audio and video feed, and then transmit it through an IP network. It also decompresses or expands incoming audio and video stream and maintains the network's data link.
- **Video Display-** LCD, HD Plasma display, LDP Projector and XGA PC Type Display are the most common video conferencing displays. Most of the company liker high-definition (HD) displays ranging between 720p and 1080p. This HD display provides the good resolution and it also offers extra viewing space. While the standard monitor devices provide less space.
- **Broadband Internet Access-** A high-speed internet service required for high quality video conferencing streaming. The broadband modem can have the huge bandwidth

capacity. This is helpful for running live conferencing sessions. To ensure smooth instant streaming stable internet connectivity is required.

- **Web Conference Software used for video conferencing-** Video conferencing software facilitate VoIP (Voice over Internet Protocol) communication. This software also allows for video streaming, application sharing and private text chats. Many video conferencing software can have record and playback ability, whiteboards, instant messaging and inbound faxing.

4.11 CHECK YOUR PROGRESS

Descriptive Type Questions-

- a) What are the major components of a video conferencing system? Why is It requiring a network for data transfer? What are these networks?
- b) How video conferencing is beneficial for intraorganizational meetings? Which tools are useful for online job candidate interviews, in place of physical face to face interviews?
- c) What are the benefits of video conferencing in modern businesses? How new communication tools helpful in modern businesses?
- d) How the video conferencing has the unique ability to bring the human connection? Explain.
- e) How Video conferencing provides a fast and secure way to communicate with each other? Explain.
- f) Can Video conferencing be used for video training? How this is powerful and cost-effective methods for delivering the professional education?
- g) What is the use of routers for video conferencing? Is it fitted in the offices for establishing internet access in computers or mobile?
- h) Which video conferencing software ensures the clarity of audio and video? Explain.
- i) What are the different good video conferencing tools available? What extensive features they offer?
- j) For which purpose video input from the camera and audio input from the microphone are converted from analog to digital? Which video conferencing software's are for this purpose?

Objective Type Questions-

- a) The Video conferencing also known as teleconference.
- b) The two are connected by coaxial cable or radio transmission.
- c) The two steps of video conferencing are.....and.....
- d) To follow the social distancing protocol, is really very important.
- e) The groups or Teamsthrough audio conferencing, video conferencing, screen sharing and real-time instant messaging.

- f) By using the HDparticipants enjoy the highest resolution and big images.
- g) Thedisplay for live video conference sessions.
- h) Participants need microphones or headsets to with other attendees at the time of the live session.
- i) The ezTalks and Lifesize are video conferencing.....
- j) The company like retail and finance to healthcare, education and the corporate world, getting the benefits of video conferencing by remote.....
- k) Video conferencing is sometime known as online video conferencing or PC video conferencing.
- l) The video conferencing is obviously very cost effective.
- m) The Microphone and audio subsystems are also an important part of for video conferencing software.
- n) Firefox and/or Chrome to never support video conferencing.
- o) Mobile applications can enable meeting attendees to participate in video conferences via their smartphones, tablets or iPads etc.
- p) The Video conferencing is an essential tool for connecting remote employees in offline mode.
- q) Video conferences require software and web page and internet communication tools enable streaming audio and video, instant messaging.
- r) There are some Special compression software of video and audio data, so that the data move faster over Wi-Fi or broadband internet.
- s) When the digital data arrives at the other endpoint, then the software decompresses it. It converts it to original size and converts it back to analog.
- t) Sound interference means that overlapping speech from the other user.

Answers (Objective Type Questions)-

- [a] Video [b] Devices [c] Compression, Transfer [d] Video Conferencing
- [e] Collaborates [f] Cameras [g] Monitor [h] Communicate
- [i] Providers [j] Communication [k] True [l] True [m] False [n] False
- [o] True [p] False [q] True [r] True [s] True [t] True

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4.13 SUGGESTED READINGS

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UNIT- 5

VIDEO CHANNEL MANAGEMENT (YOUTUBE)- TOOLS AND ACTIVITIES

5.1	INTRODUCTION
5.2	OBJECTIVES
5.3	YOUTUBE CHANNEL: AN OVERVIEW
5.4	BENEFITS OF YOUTUBE CHANNEL
5.5	TYPES OF YOUTUBE CHANNEL
5.6	YOUTUBE MARKETING: OVERVIEW
5.7	CHANNEL MANAGEMENT
5.8	POINTS TO REMEMBER
5.9	GLOSSARY
5.10	CHECK YOUR PROGRESS
5.11	BIBLIOGRAPHY/ REFERENCES
5.12	SUGGESTED READINGS

5.1 INTRODUCTION

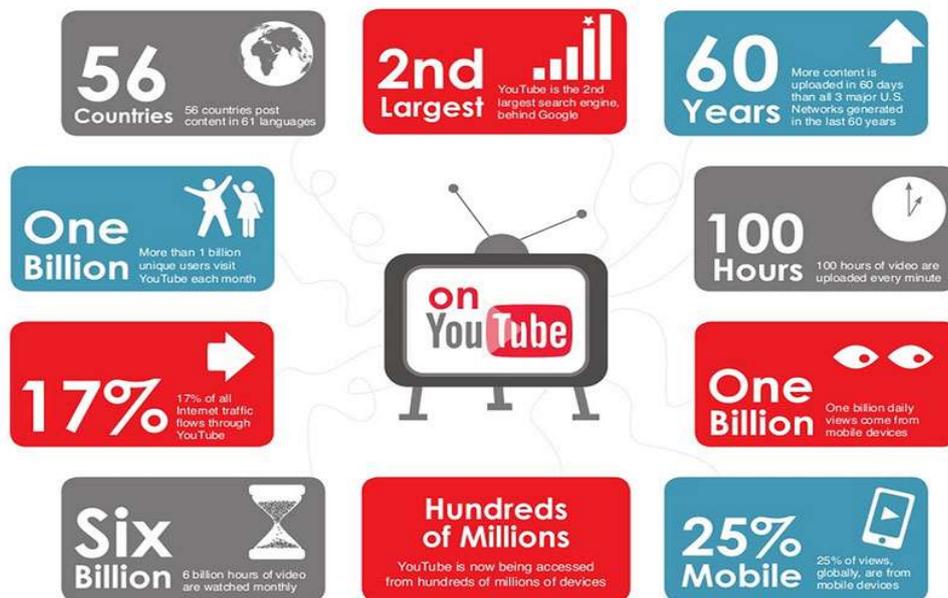
YouTube is a video-sharing platform which was started on February 14, 2005, by Steve Chen, Chad Hurley, and Jawed Karim, former employees of the PayPal. Its Headquarter in San Bruno, California. The first YouTube video ME AT THE ZOO was uploaded, and Google announced it was paying \$1.65billion for the service. YouTube is a platform where user can watch, share, upload, like and comment the videos. It was officially launched in December 2005.

Now YouTube is most popular site and application, with user watching around 6 billion hours of video every month. Features of YouTube are following:

- User can upload videos, comments and make a playlist.
- User can create a personal YouTube channel
- Like, comment and share other videos.
- User can subscribe another channel.

- YouTube is used around in 81 countries and available in 76 languages.

The Massive YouTube Ecosystem



YouTube is so popular because you can find number of videos and all the content is user-generated. On an average, 100 hours of videos are uploaded to YouTube every minute, so there's always something new to watch! And YouTube isn't a one-way street you can jump in, record and share your own videos, and become a part of the community.

And other video sites have decent levels of traffic, most businesses could start today on YouTube and do fine because it's far from saturated. Many businesses are actually investing in YouTube marketing.

Now a days person knows how to do the smart business. If you've been considering marketing on YouTube, or you've just started and haven't really found your feet, this course is especially for you. You want to build a successful YouTube channel? Then organize all your ideas at one place. This course will tell you all the key components of creating a YouTube channel, how to get views, and those views will lead to subscribers and sales for your business.

5.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Explore the types of YouTube channels one can create.
- Define the benefits of having a YouTube channel for business purposes.
- Understand YouTube channel management.

5.3 YOUTUBE CHANNEL: AN OVERVIEW

Channels are one of the coolest parts of YouTube, that provides quick access to all videos. YouTube channel is a spotlight for uploading video, comment, or to make playlist. However, without YouTube channel you have no public presence. YouTube channel is like a homepage, where user can organize the videos or arrange the playlist. User can customize their channel with logos, graphics, pictures and text description.

With help of Google Account, you can watch the videos and subscribe the channels. However, without a YouTube channel, you have no public presence on YouTube. Even if you have a Google Account, for upload videos, comment, or make playlists you need to create YouTube channel. You can create your channel on either the YouTube mobile site or YouTube website.

5.4 BENEFITS OF YOUTUBE CHANNEL

As we know social media post are not enough for growing a business, we need new strategy for increasing a traffic towards our website. YouTube introduce new strategy for promoting business through attractive videos at low cost or free. Benefits of YouTube Channel are:

- If you post a video on your channel, it automatically finds on Google.
- As YouTube is the second largest search engine, through which audience can easily reach you, by creating attractive videos or advertising their business on other people channel.
- It helps to enhance the talent of the any artist.
- The content never dies, you can re-purpose content you have already created. Using YouTube for business can help you to re-purpose content you've already created without wasting lot of time or invest on expensive equipment's.
- Through YouTube advertisement, you can reach a worldwide user.
- Videos are better to attract user.
- YouTube is an easy platform where user can upload videos and manage their account.
- You can associate your domain name with YouTube channel.
- YouTube viewer sees your video ad in another video and clicks on it.

5.5 TYPES OF YOUTUBE CHANNELS

YouTube platform provides users to create different types of channels. Anyone can create a video about any topic. Though it can be classified in following categories:

- **ANIMATION:** YouTubers can create entire animated stories using self-made digital images and dialogues. The youtubers publish short videos that each depicts a story. These videos include poems and comic stories for kids.
- **BEAUTY:** Beauty YouTubers are known for their expertise on the subjects of makeup and skincare routine. As trendsetters within the beauty industry, they often set a precedent for what brands and products will be most popular. Mostly beauty youtubers are self-

taught and viewers value their skills and candid opinions about the latest beauty products.

- **COMEDY:** Comedy YouTubers are known for poking fun at everyday human problems, create original characters, skit and publish their content with the intention of making people laugh. They separate the content according to the topic and top comedy YouTubers are self-deprecating and have excellent observational skills.
- **COOKING:** Many YouTubers specialize in one specific cuisine or type of food. They teach viewers how to prepare meals through guided tutorials. Other creators focus on easy to prepare meals, extravagant meals and healthy meals. They are an excellent source of new recipes.
- **DAILY VLOGGERS:** Daily vloggers are some of the most consistent creators on YouTube, publishing a video every day. They mainly use two camera angles to capture their daily life where one camera faces the outward and the other is selfie style. It includes two abilities to create a vlog that's the ability to create a compelling storyline out of seemingly ordinary events and the ability to provide engaging, improvised commentary as they film. The best daily vloggers feel like close friends.
- **DESIGN AND ART:** Design/art YouTubers are those that create videos showcasing their art expertise and help others to improve their artistic skills. Creators within the group explore many different mediums, including traditional drawing, digital drawing, graphic design, and painting.
- **DIY:** DIY (Do It Yourself) YouTubers teach viewers how to make customized items instead of buying them ready-made. A DIY video might teach audiences how to embellish their jeans, decorate their phone case.
- **FASHION:** These YouTubers fit in the fashion category specialize in clothing and accessories. Fashion YouTubers create content in line with their personal style, such as classic, eclectic, or modern.
- **GAMING:** Gaming YouTubers are those that create content focused on video games. They help viewers improve their skills and provide entertainment to a gaming-focused audience. The video format most commonly produced by gaming YouTubers is the let's play video. This is when a YouTuber records their screen while playing a video game and provides additional commentary.
- **HEALTH AND FITNESS:** These YouTubers detail their workout routines and diets for audiences in an effort to inspire others to lead a healthier lifestyle. Some post full-length workout videos that viewers can take with them to the gym or complete in the comfort in their own home. Others post short clips that guide viewers through quick workouts or new exercises.

- **MUSIC AND DANCE:** YouTube musicians, dancers, singers/songwriters, Choreographers comes under this category. Those who specialize in music usually publish either covers of popular songs, original compositions, or a combination of both. Creatives in dance often share choreographed routines and dance tutorials. YouTube has launched the careers of many stars and has become a destination for discovering new talent.
- **PRANKS/CHALLENGES:** YouTube creators that specialize in pranks and/or challenges shock and humor audiences. Prank YouTubers do so by tricking friends and bystanders. Challenge YouTubers attempt daring feats, like eating unusual foods. Prank/challenge videos are often the most watched and shared videos on YouTube. This kind of YouTuber publishes content that appeals to people of all ages and backgrounds.
- **PRODUCT REVIEW:** There is a clear trend, nowadays, for people to turn to the internet when they are considering making a purchase. They want to discover what other people think about products that interest them. These YouTubers specialize in the ratings, review, quality and everything about the product.
- **SPORTS:** YouTube hosts a collection of professional sports highlights, hilarious sports blunders, and even motivational sports videos. Creators within the sports category celebrate the topic of athletics, and either post videos focused on a specific sport or many.
- If a sports YouTuber focuses on a single sport, content might include product reviews and skill tutorials. Other channels incorporate multiple sports by guest starring professional athletes and performing trick shots and challenges.
- **TECH:** Technology YouTubers build their following on the basis of one subject: technology. Tech YouTubers also have a strong eye for detail. Their knowledge of technology allows them to compare new technology to previous models and make critical judgments on the value of upgrades.
- **TRAVEL:** As YouTube has grown the platform has become a hub for first-hand travel and adventure knowledge. Previously, individuals relied primarily on websites and books to plan vacations.travel YouTubers divide their content according to location or attraction. Depending on the creator they might present their travel experiences through highlight videos or through detailed vlogs.

5.6 YOUTUBE MARKETING

YouTube Marketing is the practice of promoting businesses and products on YouTube's platform, by uploading valuable videos on a company's YouTube channel or using YouTube advertisements. For online and offline Business owners and internet marketers, YouTube Marketing is an essential strategy to take advantage of the web's massive shift toward video.



The most effective tools of business lead generation are video marketing. YouTube marketing is a tool for brands. That's why we've created this complete guide for YouTube pros. Video has proven itself as one of the best-performing forms of content, and just because you're creating them for YouTube doesn't mean that you can't repurpose your videos. By video marketing you have a better chance to promote your business sales. Marketing on YouTube means marketing on another social platform.

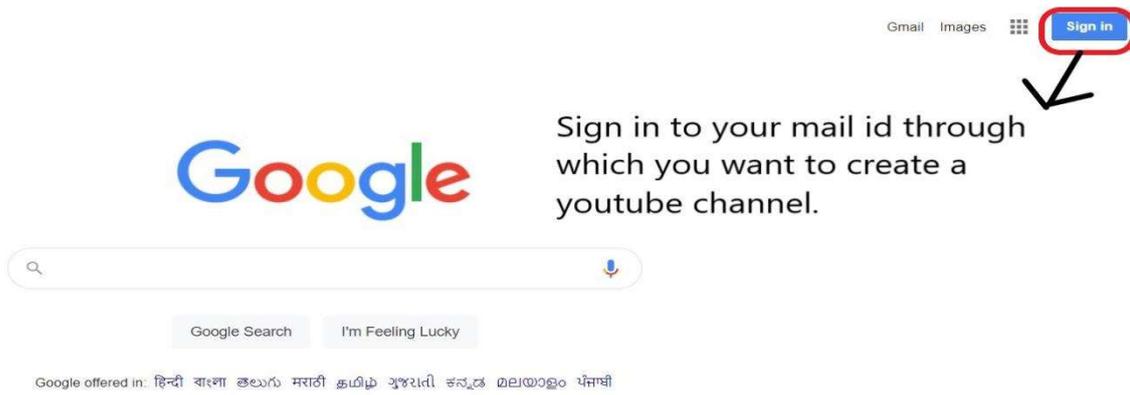
5.7 CHANNEL MANAGEMENT

YouTube is an easy and robust way to increase the business reach to millions of users across the globe. So, the YouTube channel must be properly managed to engage its subscribers and provide the best content to its users.

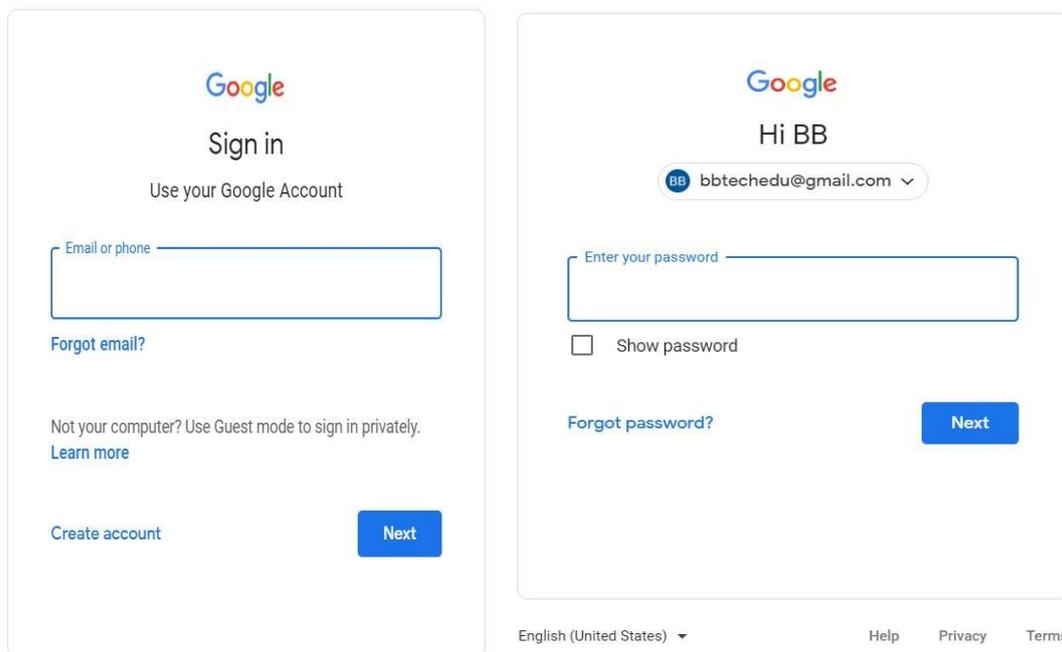
Creating A Channel

To create a channel on YouTube, you must have an account on google. Here are the steps to create a YouTube Channel:

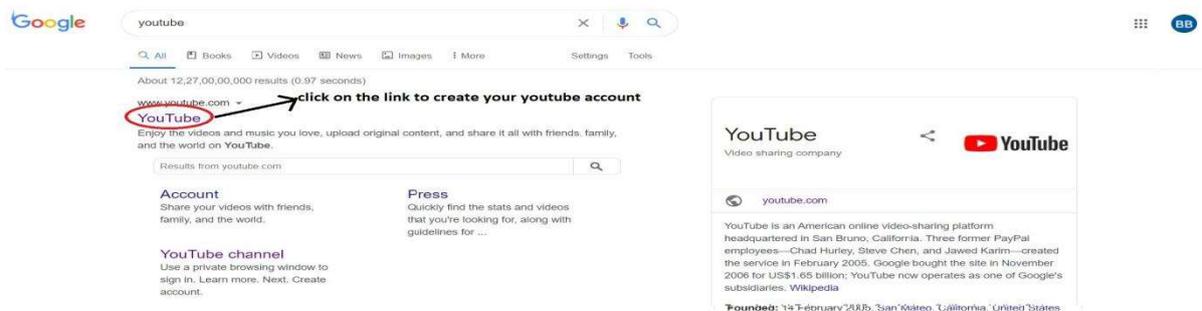
- Sign in to your Google account

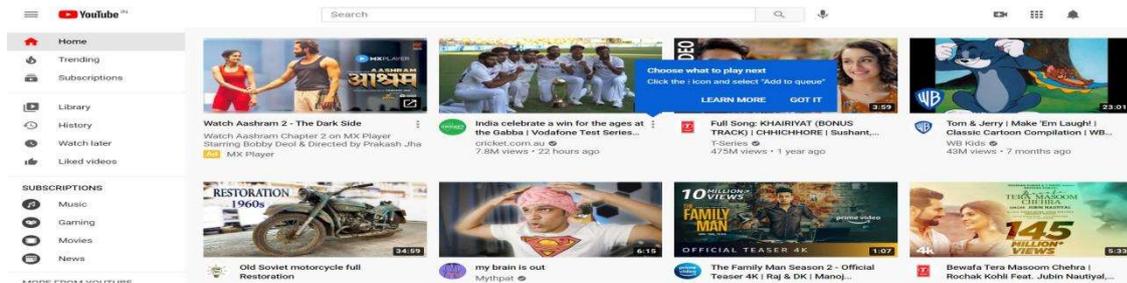


- After clicking on sign-in button, this page will open. Here you must add your email address and password

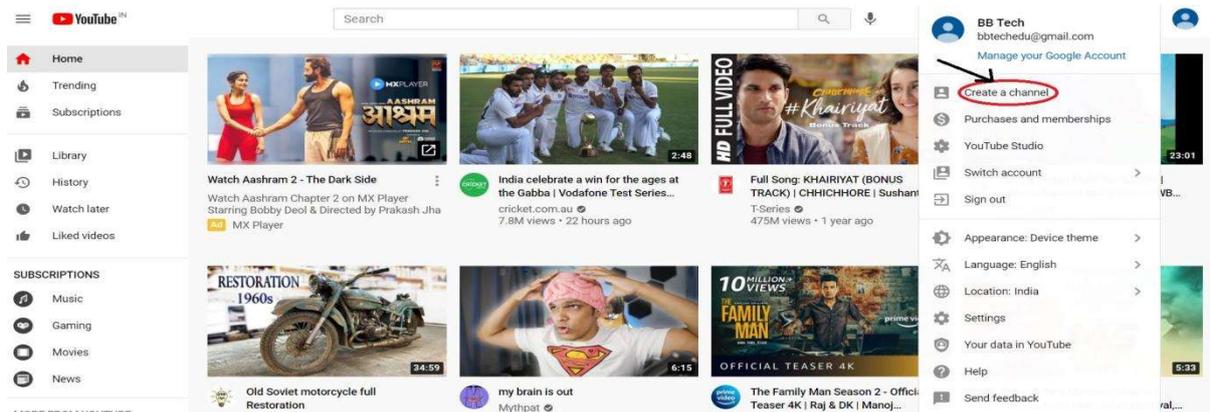


- After sign-in, click on the YouTube link through google chrome.

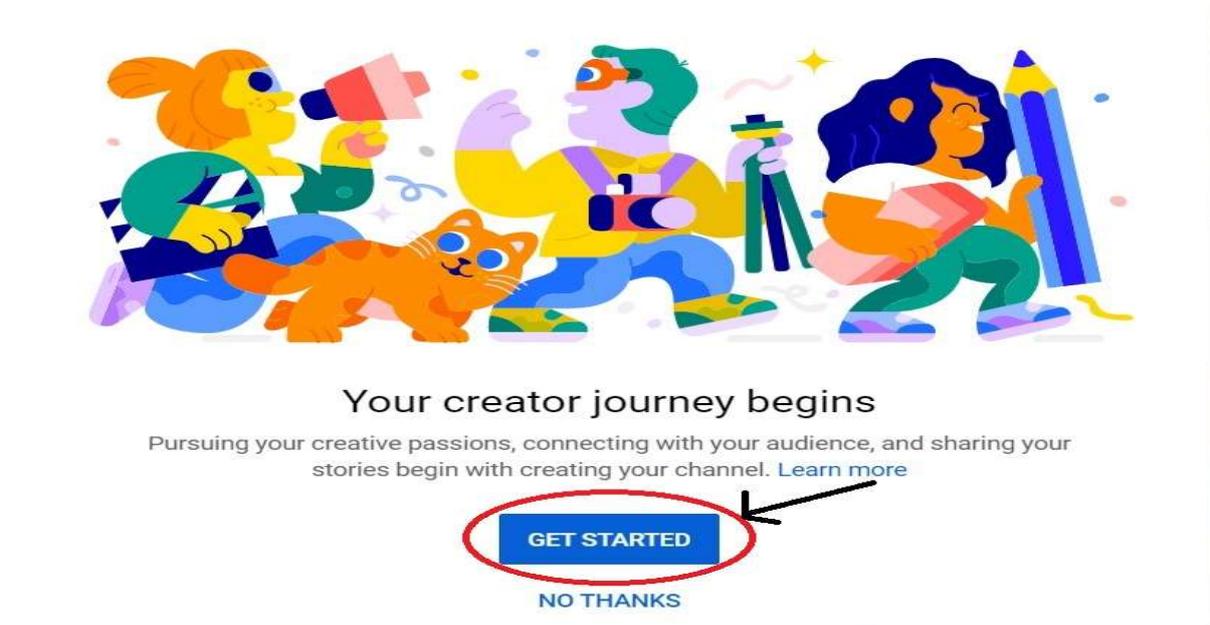




- Select the “Create a channel” option.



- After clicking on Create a channel button, this page will be displayed.



- After clicking on “Get Started” button, you’ll get two options for your channel name. From where you can any option

Choose how to create your channel

Use your name

Create a channel using the name and picture on your Google account.



BB Tech

By selecting this option, you agree to YouTube's Terms of Service.

SELECT

Use a custom name

Create a channel using a brand or other name and picture.



SELECT

As a reminder, we may share non-personally identifiable information related to your channel and/or videos with our partners, including advertisers and rights holders.

CANCEL

- After choosing the option of “Use your name”, this page will be displayed.

Nice work!

Your channel "BB Tech" has been created.

Next, follow the steps to complete your channel. You can do these steps now or come back to them later.



Upload a profile picture

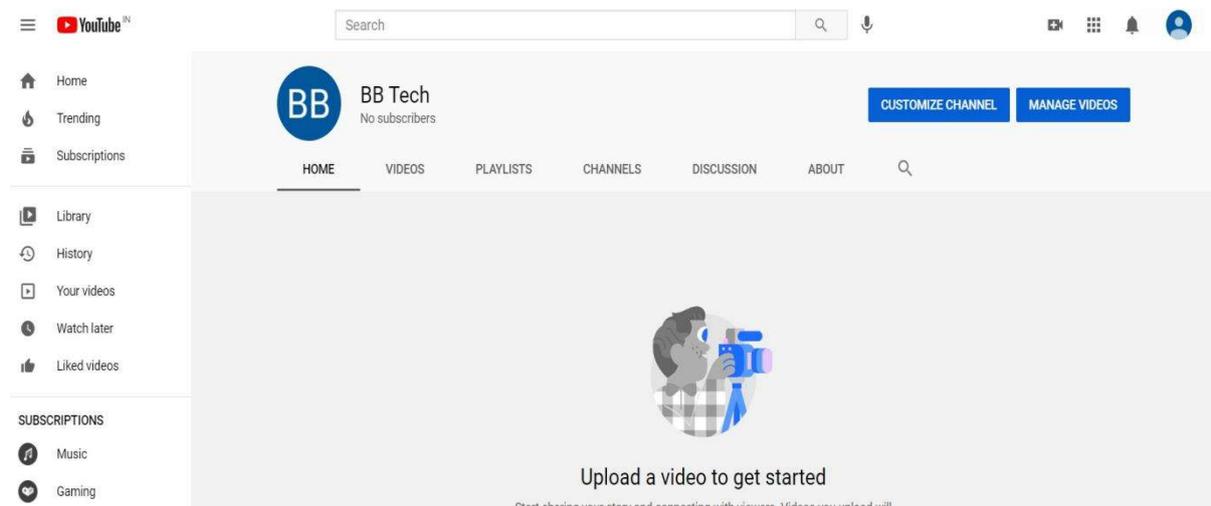
Your profile picture appears next to your videos, comments, and other places. It's your signature image on YouTube. [Learn more](#)



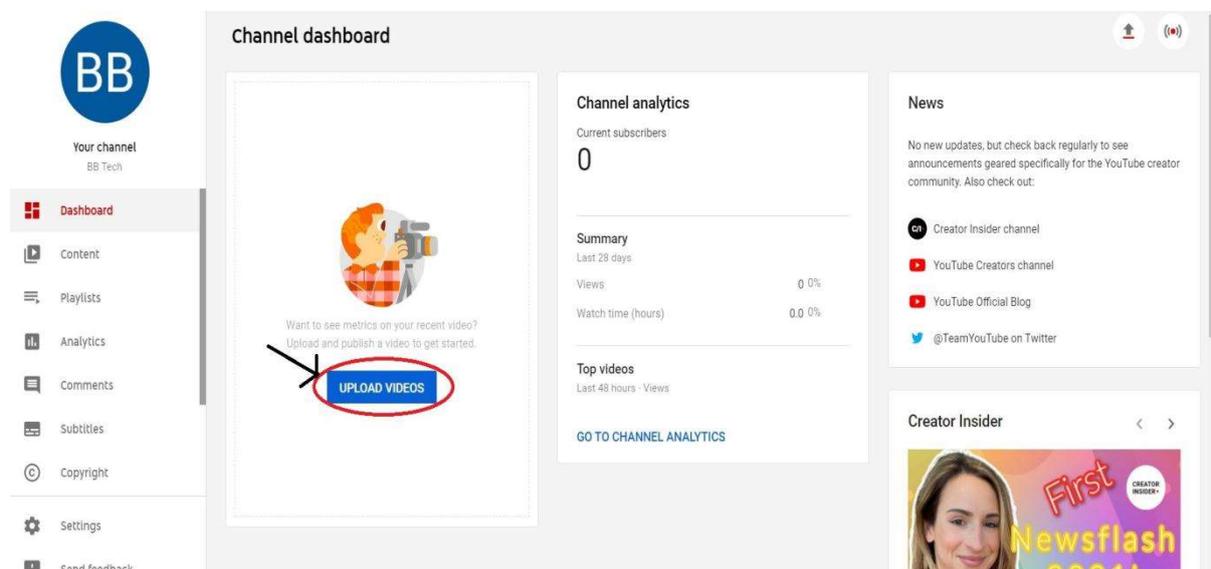
- And that's it. Your channel has been created as “BB Tech”.

Upload A Video-

Now it's time to upload quality video on your YouTube channel.



Click on the “upload videos” button to get started.



Choosing A Video Title-

Video title is an essential part of every YouTuber before uploading their video. In today’s era, having a good content and uploading quality videos alone does not give an audience. You really need to focus on the video SEO parts like title, tags, thumbnails and description of the video before uploading it to pull the audience.

A video title is piece of short and sweet information about your video. So, YouTube can understand what kind of video you are producing and who’s your target audience. The title is the part that your audience sees before the video. Here the viewers decides whether to play the video or not. The best title can make the video best.

Video Thumbnail-

Video thumbnail is basically the cover photo that represents your video on YouTube. It is called thumbnail because a small version of this graphic will show up in the recommended videos and

other search areas of YouTube. Because thumbnail is the part of the video that the viewer sees first, it is important for thumbnail to be attractive. If the thumbnail is attractive then the viewer will definitely click on it.

Video Channel Description Box-

Descriptions can convey valuable information to the user which helps viewers to find your videos in search results and understand what they'll be watching and its purpose. Most of the brands, vloggers, or other less-formally produced channel skip the description box as unnecessary. But the truth is that description box is crucial player in your YouTube marketing strategy. As description box contents (along with your titles, tags, and captions) help YouTube to determine if and where your videos rank on search or as related videos.

A well-written content with the right keywords can boost views and watch time because they help your video to appear in search results. Your description should be written before the video is made public. Before uploading the description, you should know that 5 lines of description are essential. The first two lines are displayed next to your video in search and when posted on social media.

How to write an attentive. Eye catching YouTube Channel Description?

- Include the keywords. A keyword is the main phrase you try to rank a video.
- Tell the viewers what your channel is, describe the main benefits.
- Include hashtags, it makes easier for other viewers to seek out related videos.
- Use simple words or natural language to describe your channel.
- Ends with strong CTA (Call to action), ask the user for subscribe, or turn on notification.

Deleting A Video-

YouTube clearly says, there is no way to undo this permanent action. Not only you will lose all of the comments and engagement from that video, but the most crucially, you will lose all of the views and Watch Time from that video. Deleting a video through YouTube website

Step 1 Sing in to your YouTube site, if you want to delete a video.

Step 2 Click on YouTube Studio button located towards the top-right corner of your screen, and then click on Videos.

Step 3 Check the boxes beside the videos which you want to delete.

Step 4 Click the action drop-down select delete.

Deleting a video through YouTube application

Step 1 Open the app and select located towards the top-right corner of your screen, and then click on Videos.

Step 2 Select the *My Video* from the pop-up options.

Step 3 On right side of each video, there will be a menu icon looks like three dots, tap on menu icon video which you want to delete. Now, tap on *Delete* option from the menu.

Marketing Skills-

YouTube is quickly becoming a key means for people to satisfy their information and entertainment needs, businesses that fail to include it in their online marketing strategy. Some tricks to promote your videos:

- **Complete your channel profile:** Make sure you have completed your YouTube channel profile. Write an attractive channel description and add a way for viewers to contact you so they can learn more about your business and contact you.
- **Thumbnails:** Many of us is not using while creating video, but thumbnails can have a big impact. Videos with a catchy title and appealing thumbnail usually rank higher. To get CTR (click to rate) you should use some highlighted areas, arrows, large text, and unexpected or unusual images.
- **Promote Your video on social media and other platform:** The more you will active on different social media platforms, the more audience you'll capture. Social media is another way to promote your channel, you can share your videos link on Facebook, on twitter, LinkedIn and many more platform. You can also post your full video on your blogs.
- **Connect with your audience:** It's not only important that YouTube is a social media channel, and therefore demands social interaction. Just not dump some videos on YouTube, blast them on social media and walk away from them expecting they will automatically generate more business for you. Your work is not ended by posting a video, without encouraging comments and discussion, you're missing a trick. Help your viewers, read the comments to improve your videos and show them that you value their opinion.
- **Upload videos based on keywords playlist:** It's important to select your keyword before you build your video content. It helps you to construct the best information around that specific topic and remember to include your keyword naturally throughout the content. This is best way to rank in search engine.
- **Brand your channel:** The branding of your channel is important since it represents your business and provides a great opportunity to add some identity to your channel. It focus on your content.
- **Constantly uploading:** You need to increase your posting frequency to at least one video in a week. Today's smartphones offer excellent video recording ability, and tools such as

Animoto make editing videos easy for anyone, so you don't need a design firm. It engaged followers and subsequently. advocators of your brand!

SEO For Video-

YouTube is one of the top search engines in the world, which is one of the reasons why it's such an attractive promotional tool for businesses. If you take the time to optimize the video and content of it on regular basis, you can reach to your targeted audience. Some factors to ranking your video on YouTube are:

- Title of your video: By giving title to your video be specific and use relevant keywords that allow your YouTube viewers to identify your video for relevant searches. You can use 100 characters, and you can change your title if you it's not performing well.
- Keywords: Use relevant keywords, that describe your channel.
- Tags: You need to add tags according to Google research tags.
- Audience watch time: Your total video watch time also counts towards your ranking.
- Likes/Dislikes: This is a important factor for your videos, if your videos get more likes it lead to a better ranking.
- Comments: If your video inspiring a lot of comments, it may be good.
- Subscribers: The more subscribers you have on your channel, the higher YouTube will rank your individual videos. To attract subscribers, produce good quality of videos and ask viewers to subscribe.

5.8 POINTS TO REMEMBER

- YouTube is a video-sharing platform which was started on February 14, 2005, by Steve Chen, Chad Hurley, and Jawed Karim. Its Headquarter in San Bruno, California.
- YouTube is the second largest search engine. It is a platform where user can upload a video, make playlist, likes, comments and manage their account.
- YouTube plays important role to promote your business and attract the user world-wide. You can create different types of channels.
- YouTube Marketing is an essential strategy to take advantage of the web's massive shift toward video.
- YouTube marketing skills is a key mean for user. You should follow all skills to promote your YouTube channel.
- If you take the time to optimize the video and content of it on regular basis, you can reach to your targeted audience.

- You really need to focus on the video SEO parts like title, tags, thumbnails and description of the video before uploading it to pull the audience.

5.9 GLOSSARY

- **SEO:** Search Engine Optimization.
 - **CTR:** Click to Rate
 - **CTA:** Call to Action
-

5.10 CHECK YOUR PROGRESS

Descriptive type questions-

- List the benefits of YouTube channel in terms of promoting your products/services.
- What types of marketing skills help you to promote YouTube channel?
- Define in short, the various types of YouTube channels.
- How SEO is useful for YouTube?
- How can you create YouTube channel? Write the steps.

Objective type questions-

- The title of the videos can be change. (True/False)
- YouTube is the fourth largest search engine. (True/False)
- CTR stands for Control to Rate. (True/False)
- YouTube is less popularly used for business world. (True/False)
- One cannot create and manage his/her YouTube channel without paying. (True/False)

Answer (Objective Type Question)-

[a] True [b] False [c] False [d] False [e] False

5.11 BIBLIOGRAPHY/ REFERENCES

- YouTube for Beginners, By Chandal Nolasco da Silva.
 - YouTube channels: content analysis of educational videos, by Mariana Martinho (University of Averio), Marta Pinto (University of Porto).
 - The Complete Guide to Building a Successful YouTube channel (<https://www.quicksprout.com/>)
 - <https://www.tutorialspoint.com/>
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5.12 SUGGESTED READINGS

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UNIT- 6

TECHNOLOGY ENABLED EDUCATION- INSTITUTIONAL INITIATIVES- II

6.1	INTRODUCTION
6.2	OBJECTIVES
6.3	BRIEF OVERVIEW OF TECHNOLOGY ENABLED EDUCATION
6.4	BRIEF INTRODUCTION TO SHODHGANGA-INFLIBNET
6.5	BRIEF DESCRIPTION OF RESOURCES AVAILABLE AT INFLIBNET
6.6	BRIEF OVERVIEW TO NCERT E-INITIATIVES
6.7	POINTS TO REMEMBER
6.8	GLOSSARY
6.9	CHECK YOUR PROGRESS
6.10	BIBLIOGRAPHY/ REFERENCES
6.11	SUGGESTED READINGS

6.1 INTRODUCTION

From the development of the Internet in 1980s and the invention of the World Wide Web in 1995, there has been considerable growth in the adoption of technology within educational institutions, for both distance and on-campus teaching and learning. The adoption of technologies has now spread, to a greater or lesser extent, to almost all parts of the world. Technology-Enabled Education is taken to refer to the application of some form of digital technology to teaching and/or learning in an educational context.

6.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Explore Institutional Initiatives of Technology Enabled Education.
- Define the Shodhganga initiatives.

- Explore e-resources available under Infolibnet, and NCERT.

6.3 **BRIEF OVERVIEW OF TECHNOLOGY ENABLED EDUCATION**

The term Technology-enhanced Education (TEE) is used to describe the application of technology to teaching and learning. It is a broad category that isn't particularly defined, but, in short, TEE is any technology that enhances the learning or teaching experience. The term can be used to describe both analog and digital technologies, but more recently, we see that digital TEE is taking over education in the form of different types of educational software. TEE is transforming and enhancing education and educational institutions beyond recognition. Therefore, it is impossible to be ignored! Let's explore why TEE is important for educators. Technology-Enhanced Education is important for many reasons. It is not only important because it is the standard of education that is expected today, but it can also improve education. This section explores TEE's importance in more detail. As-

- Students can learn at their own pace- Technology in education enables children to adjust to their own pace of learning. Students who need extra time can spend more time going over exercises until they understand, whilst students who need less support can continue ahead. It also frees up the teacher to help kids who need more support on an individual level.
- More resources- With TEE, educators are no longer limited to the textbooks that their institutions provide. By using other resources such as video, audio, and interactive learning, students have many different ways to learn. Teachers can find creative ways to teach their students in an engagingly. Technology has changed the learning environment so that learning is more hands-on.
- Technology keeps kids engaged- Children often struggle to stay on task or interested, particularly if it is not interactive. TEE can make school tasks more engaging, which will help your students to stay focused.
- Technology is necessary to succeed in the real world- The reality is that it is almost impossible to survive the working world without technology. Therefore, it is better if children learn how to use tech sooner rather than later. Arguably, being computer literate is more important than some of the more traditional skills that are taught in schools.

In India, Department of Higher Education, Ministry of Education is administering a programme 'National Mission on Education through Information and Communication Technology' (NMEICT) to leverage the potential of ICT to make the best quality content accessible to all learners in the country, free of cost.

6.4 BRIEF INTRODUCTION TO SHODHGANGA-INFLIBNET

All the theses and dissertations are the rich and unique source of information, often the only source for research work that does not find its way into various publication channels. As such, theses and dissertations remain an un-tapped and under-utilized asset, leading to unnecessary duplication and repetition that, in effect, is the anti-ethics of research and wastage of huge resources, both human and financial. The UGC Notification (Minimum Standards & Procedure for Award of M.Phil./ Ph. D Degree, Regulation, 2009 and amendment made on 5th May 2016 mandates submission of electronic version of theses and dissertations intending to facilitate its open access to the academic community world-wide. Online availability of electronic theses through centrally maintained digital repository not only ensures easy access and archiving of Indian doctoral theses but also helps in raising the standard and quality of research. The open access to theses and dissertations would overcome the serious problem of duplication of research and poor quality resulting from the “poor visibility” and the “unseen” factor in research output. As per the Regulation, the responsibility of setting-up, hosting and maintaining the digital repository and making it accessible to all institutions and universities, is assigned to the INFLIBNET Centre. Shodhganga" is the name coined to denote digital repository of Indian Electronic Theses and Dissertations (ETD) set-up by the INFLIBNET Centre as per UGC notification 2009/2016. Shodhganga stands for the reservoir of Indian intellectual output stored in a repository hosted and maintained by the INFLIBNET Centre. The word "Shodh" originates from Sanskrit and stands for research and discovery, Ganga is a holy and popular river with its root in Indian culture and civilization.

Shodhganga- INFLIBNET Centre

The Shodhganga centre is setup using DSpace, an open-source digital repository software, initially developed by MIT and HP, now updated and maintained by DuraSpace, a non-profit Organization. The DSpace uses internationally recognized protocols and interoperability standards. The Shodhganga INFLIBNET Centre provides a platform for research scholars to deposit their Ph.D. theses and make it available to the entire scholarly community in open access. The repository can capture, index, and store, disseminate and preserve ETDs submitted by the researchers. Shodhganga Repository at INFLIBNET replicates the academic structure of each university in terms of Departments/Centres and Colleges each university has. This structure facilitates research scholars from universities to deposit their theses in the respective Department / Centre/ College.



URL- <https://shodhganga.inflibnet.ac.in>

Features of Shodhganga-

- Open access repository of Indian theses for world-wide access;
- Customized ingestion interface for ease of submission of theses using DSpace;
- Integration with Theses Database of IndCat (with 2.74 Lakh bibliographic data); and
- Multi-lingual support for theses hosted in the repository. Hindi, Gujarati, Tamil, Sanskrit, Malayalam, Urdu, Marathi already enabled.

6.5 BRIEF DESCRIPTION OF RESOURCES AVAILABLE AT INFLIBNET

Information and Library Network (INFLIBNET) Centre, Gandhinagar is an Autonomous Inter-University Centre (IUC) of University Grants Commission, New Delhi (Ministry of Education, Govt. of India). It is a major National Programme initiated by the UGC in March 1991 as a project under the IUCAA; it became an independent Inter-University Centre in June 1996. INFLIBNET is involved in modernizing university libraries in India using the state-of-art technologies for the optimum utilization of information. The technology being a driving force in the contemporary education system, the Centre has taken-up several initiatives for the benefit of the academic community in India. These initiatives are categorized into various phenomenon's as mentioned below:

1-Library Automation-

INDCAT-Union Catalogue of Indian Universities (IndCat) is a by-product of the library automation of the INFLIBNET Centre wherein universities that are signatory to the MoU on library automation contribute the bibliographic records of documents that are available in their libraries. The scope of the IndCat has now been extended to invite contributions from

universities and other institutions that have not signed MoU with INFLIBNET Centre on library automation.

SOUL 2.0-The SOUL 2.0 (Software for University Libraries) is state-of-the-art integrated library management software designed and developed by the INFLIBNET Centre based on requirements of colleges, universities and other academic libraries. The software is compliant to international standards for bibliographic formats and circulation protocols. It is compliant to international standards such as MARC 21 for the bibliographic format, Unicode based Universal Character Sets for multilingual bibliographic records and NCIP 2.0 and SIP 2 based protocols for RFID, electronic surveillance and control.

2- E-Consortium

E-SHODHSINDHU-e-ShodhSindhu is an initiative of Consortium for Higher Education Electronics Resources by Ministry of Education. It provides access to e-resources (10000+ full-text journals, 164300+ e-Books and 4 databases through e-ShodhSindhu and 600000 e-Books through NDL) to Universities, Colleges and Centrally Funded Technical Institutions in India.

N-LIST-The Project entitled "National Library and Information Services Infrastructure for Scholarly Content (N-LIST)", graduated as a regular scheme of UGC under UGC-INFONET Digital Library Consortium as college component, is merged into e -ShodhSindhu: Consortia for Higher Education E-Resources. The N-LIST provides access to 6,000+ journals, 1,64,300+ ebooks under N-LIST and 6,00,000 ebooks through NDL to all Govt., Govt.-aided as well as non-aided colleges through a proxy server / shibboleth.

INFISTATS-The Centre has developed a software called InfiStats, for monitoring the usage statistics of various e-resources made accessible to the member institutions. The InfiStats portal imports the usage data from the publisher's website automatically and store it in a database on InfiStats platform. The InfiStats interface provides title-level COUNTER-compliant reports to member institutions. The member institutions can also log-on to this portal for monitoring the usage of their respective e-resources.

INFED-INFLIBNET Access Management Federation (INFED) was setup which uses Shibboleth, standard-based open-source software, for authenticating authorized users from colleges and universities and provide them seamless access to e-resources from anywhere, anytime. Shibboleth offers a mechanism for users to access multiple resources within a federated single sign-on framework.

SHODHSHUDDHI-The Govt. of India was to provide Plagiarism Detection Software to all Indian Universities/Institutions including Central Universities, State Universities, deemed to be Universities, Private Universities, Centrally Funded Technical Institutions (CFTIs), Institute of National importance (INIs), Inter University Centres of UGC (IUCs). The INFLIBNET

Centre is a nodal agency to execute the project/initiative under the aegis of Ministry of Education.

INFISTATS-The Centre has developed software called InfiStats, for monitoring the usage statistics of various e-resources made accessible to the member institutions. The InfiStats portal imports the usage data from the publisher's website automatically and store it in a database on InfiStats platform. The InfiStats interface provides title-level COUNTER-compliant reports to member institutions. The member institutions can also log-on to this portal for monitoring the usage of their respective e-resources.

3-OPEN ACCESS INITIATIVE

SHODHGANGA-Shodhganga is a digital repository set-up for submission of electronic versions of theses and dissertations by students / research scholars in universities in India and makes them available in open access to the world-wide academic community in response to the UGC Notification (Minimum Standards & Procedure for Award of M.Phil. / Ph.D Degree, Regulation, 2009 and amendment made in 2016) where-in the responsibility of maintaining the digital repository of Electronic Theses and Dissertations (ETDs) is assigned to the INFLIBNET Centre.

SHODHGANGOTRI-Under this initiative, research scholars/research supervisors in universities could deposit an electronic version of approved synopsis submitted by research scholars to the universities for registering themselves under the PhD programme. Synopses in Shodhgangotri would later be mapped to full text thesis in Shodhganga. As such, once the full-text thesis is submitted for a synopsis, a link from the synopsis in Shodhgangotri to the full-text theses in Shodhganga will be provided.

INSTITUTIONAL REPOSITORY-The Centre has established an institutional repository called IR@INFLIBNET using DSpace, opensource software. The papers published in the proceedings of the CALIBER and PLANNER is uploaded into the repository. The Repository also includes course materials, newspaper clippings, etc.

INFOPORT-INFOPORT: INFLIBNET Subject Gateway for Indian Electronic Resources is designed to facilitate registering of an Internet resource into the portal and extending its access to users. INFOPORT supports browsing of Internet resources by Dewey Decimal Classification (DDC) Scheme.

RESEARCH PROJECT DATABASE-The Research Project Database provides details of completed and ongoing projects carried out by faculty members working in universities and institutions across the country. The Centre gets project details along with the project reports in print/digital formats from the project investigators of Minor Research Projects (MRP) funded by the UGC.

6.6 BRIEF OVERVIEW TO NCERT E-INITIATIVES

The National Council of Educational Research and Training (NCERT) is an autonomous organisation set up in 1961 by the Government of India to assist and advise the Central and State Governments on policies and programmes for qualitative improvement in school education. The major objectives of NCERT and its constituent units are to: undertake, promote and coordinate research in areas related to school education; prepare and publish model textbooks, supplementary material, newsletters, journals and develops educational kits, multimedia digital materials, etc. organise pre-service and in-service training of teachers; develop and disseminate innovative educational techniques and practices; collaborate and network with state educational departments, universities, NGOs and other educational institutions; act as a clearing house for ideas and information in matters related to school education; and act as a nodal agency for achieving the goals of Universalization of Elementary Education. In addition to research, development, training, extension, publication and dissemination activities, NCERT is an implementation agency for bilateral cultural exchange programmes with other countries in the field of school education.

The screenshot displays the NCERT website homepage. At the top, the NCERT logo and name in Hindi and English are visible. Below the navigation menu, a prominent banner for 'PMeVIDYA: A Comprehensive Digital/ Online/ On - Air Education Initiative' is shown. The banner lists several key services: DIKSHA (One Nation-One Digital Platform), Community Radio and Podcast, 12 TV Channels (One Class, One Channel), eContents for DIVYANG on DAISY and in Sign Language, SWAYAM courses in MOOC's format, and IITPAL for IIT/JEE preparation. A yellow bar at the bottom of the banner states: 'All these will benefit nearly 25 crore school going children across the country'. Below the banner, there are links for 'Latest Update', 'School Bag Policy 2020', 'NCERT DOCTORAL FELLOWSHIPS 2020 - Apply Online (Last Date 05-01-2021)', and 'COVID-19 Campaign'.

Website- www.ncert.nic.in

DIKSHA (www.diksha.gov.in)-

DIKSHA (Digital Infrastructure for Knowledge Sharing) is a national platform for school education, an initiative of National Council for Education Research and Training (NCERT), MHRD. DIKSHA was developed based on the core principles of open architecture, open access, open licensing diversity, choice and autonomy as outlined in the Strategy and Approach

Paper for the National Teacher Platform released by the government in May, 2017. DIKSHA itself was launched by the Hon' Vice President of India on Sept 5th, 2017 and has since been adopted by 35 states/UT's across as well as CBSE and NCERT and by crores of learners and teachers.

DIKSHA is built on open-source technology, made in India and made for India, which incorporates internet scale technologies and enables several use-cases and solutions for teaching and learning. DIKSHA is built using MIT licensed open-source technology called Sunbird, which is a digital infrastructure for learning and is designed to support multiple languages and solutions and offers over a 100 micro services as building blocks for the development of platforms and solutions.

DIKSHA, as mentioned earlier, is available for the use of all states and UTs of India. Each state/UT leverages the DIKSHA platform in its own way, as it has the freedom and choice to use the varied capabilities and solutions of the platform to design and run programs for their teachers and learners. DIKSHA policies and tools make it possible for the education ecosystem (educationist, experts, organizations, institutions - government, autonomous institutions, non-govt and private organizations) to participate, contribute and leverage a common platform to achieve learning goals at scale for the country.

DIKSHA can be accessed by learners and teachers across the country and currently supports 18+ languages and the various curricula of NCERT, CBSE and SCERTs across India. The platform is being leveraged and developed for school education, foundational learning programs and to support inclusive learning for underserved and differently-abled communities of learners and teachers.

NROER (www.nroer.gov.in)-

NROER (National Repository of Open Educational Resources) is a collaborative platform, which brings together everyone interested in school and teacher education. Initiated by the Department of School Education and Literacy, Ministry of Human Resource Development, Government of India and managed by the Central Institute of Educational Technology, National Council of Educational Research and Training, the Repository runs on the MetaStudio platform, an initiative of the Knowledge Labs, Homi Bhabha Centre for Science Education.

NISHTHA (National Initiative for School Heads' and Teachers' Holistic Advancement)-

(www.itpd.ncert.gov.in)

NISHTHA is a capacity building programme for "Improving Quality of School Education through Integrated Teacher Training". It aims to build competencies among all the teachers and school principals at the elementary stage. The functionaries (at the state, district, block, cluster level) shall be trained in an integrated manner on learning outcomes, school-based assessment, learner- centre pedagogy, new initiatives in education, addressing diverse needs of children

through multiple pedagogies, etc. This is being organized by constituting National Resource Groups (NRGs) and State Resource Groups (SRGs) at the National and the State level who will be training 42 lakhs teachers subsequently. A robust portal/Management Information System (MIS) for delivery of the training, monitoring and support mechanism has been infused with this capacity building initiative.

ePathshala (www.epathshala.nic.in)

ePathshala is a portal/app developed by the CIET, and NCERT. It was initiated jointly by the Ministry of Human Resource Development, CIET, and NCERT, and launched in November 2015. It hosts educational resources for teachers, students, parents, researchers and educators, can be accessed on the Web, and is available on Google Play, App Store and Windows. The content is available in English, Hindi and Urdu.

The platform offers a slew of educational resources, including NCERT textbooks for classes 1-12, audio-visual resources by NCERT, periodicals, supplements, teacher training modules and a variety of other print and non-print materials. These materials can be downloaded by the user for offline use with no limits on downloads. The app supports flip book format to provide a more realistic experience.

Tamanna- (Try And Measure Aptitude And Natural Abilities)

(www.ncert.nic.in/tamanna)

Under the aegis of Ministry of Human Resource Development, Govt. of India, the Central Board of Secondary Education (CBSE) and National Council of Educational Research and Training (NCERT), New Delhi have developed Tamanna - An Aptitude Test for Senior School Students to enable stakeholders know the aptitude of students of classes IX and X. Details about use of aptitude test, dimensions measured in the test, construction and standardization of the test, administration and scoring and understanding the meaning of aptitude test scores are available in the test manual. As a collaborative work, piloting of the aptitude test was done by the CBSE with 17,000 students studying in classes IX and X through its affiliated schools across different parts of the country.

e-Kalpa

An integrated android based mobile app 'e- kalpa' enabling technology delivery, interactive learning and real time data recording was developed for better reaching out to farming communities. It has GPS enabled platform, developed to connect stakeholders of plantation sector with emphasis to coconut, arecanut and cocoa. e-kalpa is the integration of five major services viz., farmers issue reporting and supporting, synchronized farming, farmer diary, knowledge base and notifications and is available in English, Hindi, Malayalam and Kannada languages. It provides the farmer, latest CPCRI technologies and farming practices for

increasing yield. It has online reporting facility for any type of issues related on farming which needs immediate solutions from experts.

e-Yantra (www.e-yantra.org)

e-Yantra is a robotics outreach project, an initiative of the Department of Computer Science and Engineering at the Indian Institute of Technology, Bombay (IIT Bombay). It is funded by the Ministry of Education, Government of India, under the National Mission on Education through ICT (NMEICT). The goal of e-Yantra is to complement existing Higher Education systems worldwide and solve local problems across a variety of domains such as: Agriculture, Disaster, Manufacturing Defense, Home, Smart Cities and Service Industries through technology. The mission of this project is to create the next generation of engineers with a practical outlook to help in providing pragmatic solutions to real-world problems. The initiative seeks to provide hands-on learning-infrastructure to engineering students who have limited access to labs and mentors.

6.7 POINTS TO REMEMBER

- Shodhganga" is the name coined to denote digital repository of Indian Electronic Theses and Dissertations (ETD) set-up by the INFLIBNET Centre as per UGC notification 2009/2016.
- Information and Library Network (INFLIBNET) Centre, Gandhinagar is an Autonomous Inter-University Centre (IUC) of University Grants Commission, New Delhi (Ministry of Education, Govt. of India).
- The National Council of Educational Research and Training (NCERT) is an autonomous organisation set up in 1961 by the Government of India to assist and advise the Central and State Governments on policies and programmes for qualitative improvement in school education.

6.8 GLOSSARY

- Tamanna- Try And Measure Aptitude And Natural Abilities.
- NCERT- National Council of Educational Research and Training.
- NISHTHA- National Initiative for School Heads' and Teachers' Holistic Advancement.
- NROER- National Repository of Open Educational Resources.
- DIKSHA- Digital Infrastructure for Knowledge Sharing.

6.9 CHECK YOUR PROGRESS

- a) How do you define technology enabled learning initiatives by several institutions for one's overall learning enhancement?
- b) List the various e-resources under Infflibnet.

- c) How e-educational initiatives of NECRTs' are beneficial for teacher's development? Explain.
- d) List 5 key characteristics of DIKSHA.

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- <https://diksha.gov.in/about/>
- <https://nroer.gov.in/welcome>
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- <https://epathshala.nic.in/>
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6.11 SUGGESTED READINGS

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- www.itpd.ncert.gov.in
- www.epathshala.nic.in

UNIT- 7

TECHNOLOGY ENABLED LEARNING TOOLS/ PLATFORMS- II

7.1	INTRODUCTION
7.2	OBJECTIVES
7.3	OVERVIEW OF TECHNOLOGY ENABLED LEARNING PLATEFORMS
7.4	VIRTUAL LABS
7.5	SWAYAM PRABHA
7.6	SPOKEN TUTORIAL
7.7	CONSORTIUM FOR EDUCATIONAL COMMUNICATION
7.8	MISCELLANEOUS TOOLS
7.9	POINTS TO REMEMBER
7.10	GLOSSARY
7.11	CHECK YOUR PROGRESS
7.12	BIBLIOGRAPHY/ REFERENCES
7.13	SUGGESTED READINGS

7.1 INTRODUCTION

Technology-enabled education aims to focus on increasing access to quality teaching and learning by supporting policy formulation and innovation in the application of ICT in education, and the development of ICT skills. Technology-enabled education has a transformative effect on teaching and learning. Technology-enabled education works with a range of technologies for teaching and learning, including mobile devices, online learning, and low-cost technologies such as audio and video, radio, and TV.

Technology-Enabled education initiatives-

- Use ICT and open educational resources in education helps to strengthen educational policy implementation.
- It supports the research on technology-enabled learning for evidence-based advocacy and decision-making.
- Works with government, industry, and academic institutions to develop relevant and innovative courses, teaching-learning methods, etc.
- Helps Institutions to use technology-enabled education for program delivery.
- Implements tested models at scale and develop new models for teaching and learning, using emerging technologies.

7.2 **OBJECTIVES**

After the successful completion of this unit, you will be able to-

- Define various technology supported learning platforms.
- Explore several portals/resource platforms used for technology enhanced learning, i.e. Virtual labs, MookIT, NIELIT, Swayam Prabh, etc.

7.3 **OVERVIEW OF TECHNOLOGY ENABLED LEARNING PLATFORMS**

Technology-Enhanced Learning (TEL) is concerned with using technologies to support learning whether the learning is on campus or remotely. Technologically, TEL supported by instructional films, radio, and television (Westera 2010), animated films, educational videos, etc. Currently, TEL pertains more tools where one can use computer-based technologies, including smartphones and other smart devices.

Learning can be considered as a process whereby the learner accesses concepts and ideas, assimilating these through practice and ultimately demonstrating mastery. Enhancements of learning seek to improve parts of this practice and process. With the progress of technologies, such enhancements are achieved through the facilitations of fundamental activities of learning by technology in various forms. Thus, what technology-enhanced learning ultimately offers are scalability, flexibility, and new methods of learning. Several tools/platforms are used by the learners to take the advantage of Technology-Enhanced Learning, as-

- Virtual Labs (www.vlab.co.in)
- Swayam Prabha (www.swayamprabha.gov.in)
- Spoken Tutorial (www.spoken-tutorial.org)
- Consortium for Educational Communication (www.cec.nic.in/cec)
- World Initiatives of Open Learning (www.oedb.org)
- OER Commons (www.oercommons.org)
- VIDWAN (www.vidwan.inflibnet.ac.in)
- FOSSEE (www.fossee.in)

- Quantum and Nano Computing Virtual Center (www.dei.ac.in/dei/quantumNano)
- OSCAR (www.oscar.iitb.ac.in)
- IRINS (www.irins.org/irins)
- ILearn Online Education (www.ilearn.gov.in)
- National Institute of Electronics & Information Technology (www.nielit.gov.in/content/online-classes-page)
- MOOKIT (www.mookit.in)

7.4 VIRTUAL LABS

Key objectives of the virtual labs are- (www.vlab.co.in)

- To provide remote-access to Labs in various disciplines of Science and Engineering. These Virtual Labs would cater to students at the undergraduate level, post graduate level as well as to research scholars.
- To enthuse students to conduct experiments by arousing their curiosity. This would help them in learning basic and advanced concepts through remote experimentation.
- To provide a complete Learning Management System around the Virtual Labs where the students can avail the various tools for learning, including additional web-resources, video-lectures, animated demonstrations and self-evaluation.
- To share costly equipment and resources, which are otherwise available to limited number of users due to constraints on time and geographical distances.

7.5 SWAYAM PRABHA

The SWAYAM PRABHA is a group of 34 DTH channels devoted to telecasting of high-quality educational programmes on 24X7 basis using the GSAT-15 satellite. Every day, there will be new content for at least (4) hours which would be repeated 5 more times in a day, allowing the students to choose the time of their convenience. The channels are uplinked from BISAG, Gandhinagar. The contents are provided by NPTEL, IITs, UGC, CEC, IGNOU, NCERT and NIOS. The INFLIBNET Centre maintains the web portal. (www.swayamprabha.gov.in)

7.6 SPOKEN TUTORIAL

Spoken Tutorial is a multi-award-winning educational content portal. Here one can learn various Free and Open-Source Software all by oneself. Our self-paced, multi-lingual courses ensure that anybody with a computer and a desire for learning, can learn from any place, at any time and in a language of their choice. All the content published on this website are shared under the CC BY SA license.

All courses are simple and easy to follow even for a beginner but they also meet the growing needs of the learner. All digital content ensures that learning happens at all levels - Basic,

Intermediate and Advanced. All the content mandates side-by-side practice thereby ensuring that learners are actively learning. Many of the software taught, are used in various disciplines of Engineering, pure Sciences and several other Under-Grad and Post-Grad studies, and can be extended to Commerce, Arts and Management streams as well. Alongside these, there are some courses relevant at School level, too, which help school students to visualize difficult concepts of Math and Science. These can also be used by Teachers to prepare lesson plans, explain abstract concepts and give digital assignments to students. (www.spoken-tutorial.org)

7.7 CONSORTIUM FOR EDUCATIONAL COMMUNICATION

The Consortium for Educational Communication, popularly known as CEC, is one of the Inter University Centres set up by the University Grants Commission of India. It has been established with the goal of addressing the needs of Higher Education through the powerful medium of Television along with appropriate use of emerging Information Communication Technology (ICT). Realizing the potential and power of television to act as a means of educational knowledge dissemination, UGC started the Countrywide Classroom Programmes in the year 1984. For production of such programmes, Media Centres were set up at 6 Universities. Subsequently CEC emerged in 1993 as a nodal agency to coordinate, guide & facilitate such educational production at the National level. Today 21 Media Centres work towards achieving this goal under the umbrella of CEC. (www.cec.nic.in/cec)

7.8 MISCELLANEOUS TOOLS

World Initiatives of Open Learning (www.oedb.org)

OEDb is a comprehensive online education directory for both free and for credit learning options. We offer up-to-date, detailed program information from accredited online colleges, along with a categorized list of over 8000 free online college courses from well-known universities.

OER Commons (www.oercommons.org)

The worldwide OER movement is rooted in the human right to access high-quality education. This shift in educational practice is not just about cost savings and easy access to openly licensed content; it's about participation and co-creation. Open Educational Resources (OER) offer opportunities for systemic change in teaching and learning content through engaging educators in new participatory processes and effective technologies for engaging educators in new participatory processes and effective technologies for engaging with learning.

VIDWAN (www.vidwan.inflibnet.ac.in)

VIDWAN is the premier database of profiles of scientists / researchers and other faculty members working at leading academic institutions and other R & D organization involved in teaching and research in India. It provides important information about expert's background,

contact address, experience, scholarly publications, skills and accomplishments, researcher identity, etc. The database developed and maintained by Information and Library Network Centre (INFLIBNET) with financial support from the National Mission on Education through ICT (NME-ICT). The database would be instrumental in selection of panels of experts for various committees, taskforce, established by the Ministries / Govt. establishments for monitoring and evaluation purposes.

FOSSEE (www.fossee.in)

FOSSEE (Free/Libre and Open-Source Software for Education) project promotes the use of FLOSS tools to improve the quality of education in our country. We aim to reduce dependency on proprietary software in educational institutions. We encourage the use of FLOSS tools through various activities to ensure commercial software is replaced by equivalent FLOSS tools. We also develop new FLOSS tools and upgrade existing tools to meet requirements in academia and research. The FOSSEE project is part of the National Mission on Education through Information and Communication Technology (ICT), Ministry of Education (MoE), Government of India.

Quantum and Nano Computing Virtual Center (www.dei.ac.in/dei/quantumNano)

The Quantum-Nano Centre is a multidisciplinary centre at Dayalbagh Educational Institute, Agra set up under MHRD National Mission on Education through ICT, with partners as IIT Kanpur, IIT Delhi and IIT Madras, besides several international collaborators. With a focus on the rapidly growing area of quantum-nano computing and quantum information sciences, the Quantum-Nano Centre provides an environment for scientists and mathematicians to explore the fundamental physical characteristics of quantum systems, to devise and implement prototype quantum computers, and to develop quantum algorithms and novel applications. Through a vigorous program of lectures, seminars, and workshops, the Centre stimulates intellectual exchange among students, faculty, and academic partners. The mission of Quantum and Nano Computing Virtual Center is to aggressively explore and advance the application of quantum-nano systems to a vast array of relevant information processing techniques. We will accomplish this by creating a truly unique environment that fosters cutting-edge research and collaboration between researchers in the areas of computer science, engineering, mathematical, chemical and physical sciences.

OSCAR (www.oscar.iitb.ac.in)

The main goal of Project OSCAR (Open-Source Courseware Animations Repository) is to build a large repository of web-based, interactive animations and simulations, referred to as learning objects (LOs), for teaching and learning concepts in science and technology. These could be useful not only for a classroom environment but also for enabling independent learning and distance education. The current goal is to develop LOs for topics in various subjects at the Undergraduate and Postgraduate levels. A learning object is a digital resource

that contains an objective, a learning activity and an assessment. Examples of learning objects are educational animations, simulations, and webpages for e-learning that contain text, images and media.

IRINS (www.irins.org/irins)

IRINS is web-based Research Information Management (RIM) service developed by the Information and Library Network (INFLIBNET) Centre. The portal facilitates the academic, R&D organizations and faculty members, scientists to collect, curate and showcase the scholarly communication activities and provide an opportunity to create the scholarly network. The IRINS is available as free software-as-a-service to the academic and R&D organizations in India. The IRINS would support to integrate the existing research management system such as HR system, course management, grant management system, institutional repository, open and commercial citation databases, scholarly publishers, etc. It has integrated with academic identity such as ORCID ID, ScopusID, Research ID, Microsoft Academic ID, Google Scholar ID for ingesting the scholarly publication from various sources.

iLearn Online Education (www.ilearn.gov.in)

The initiatives of Government of India, under the Third India-Africa Summit announced as the e-VidyaBharti network project which offers certificate, diploma, undergraduate, and postgraduate degree courses. The students and professionals in Africa can pursue courses offered by premier Indian institutions in emerging areas. The reputed public and private universities can offer short-term, undergraduate and postgraduate courses on the iLearn portal. Such online courses are offered as a four-quadrant approach: e-Tutorial, e-Content, discussion forums, and assessments.

Only learners who are nationals of countries in Africa participating in the e-VBAB (e-Vidyabharati and e-Aarogyabharati) Network Project residing in those countries are eligible to register for Programmes/ Courses on the iLearn Portal

National Institute of Electronics & Information Technology

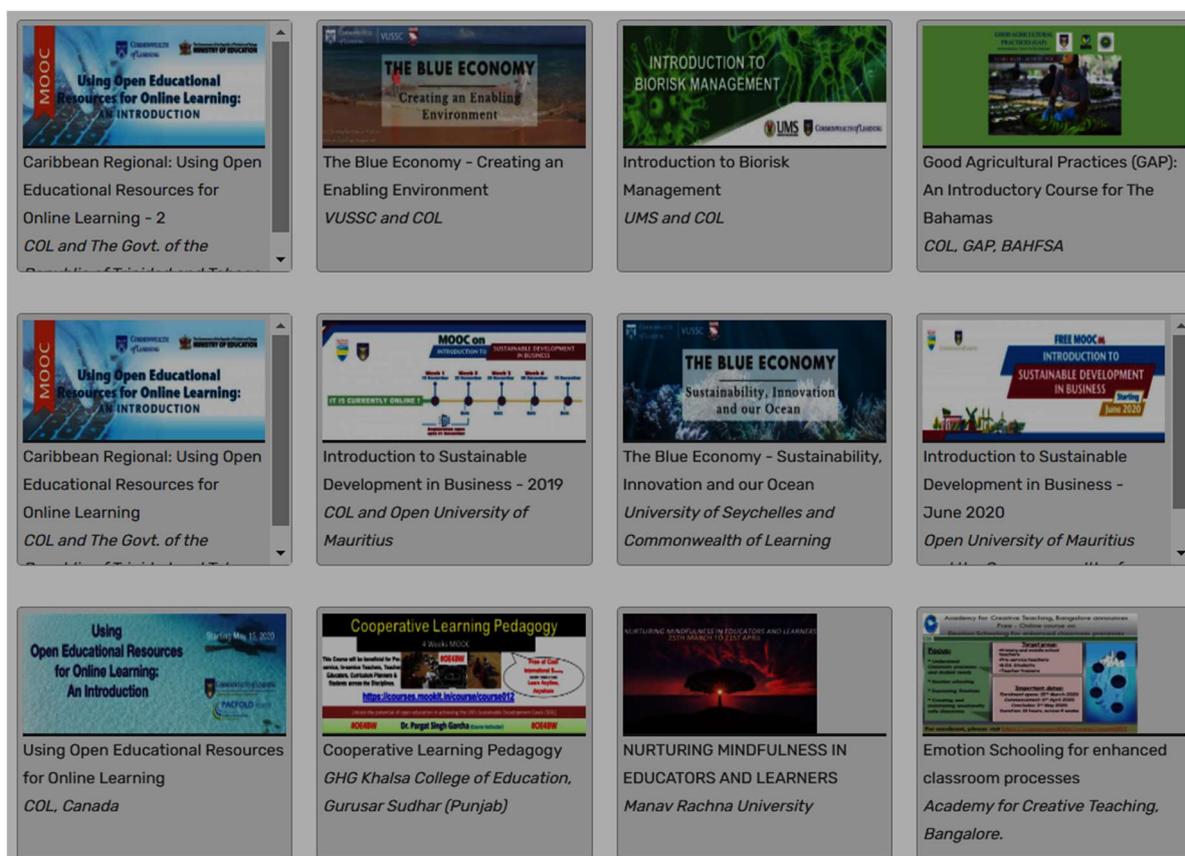
(www.nielit.gov.in/content/online-classes-page)

National Institute of Electronics & Information Technology (NIELIT), is an autonomous scientific society under the Ministry of Electronics & Information Technology (MoE&IT), Government of India. NIELIT is engaged both in Formal and Non-Formal education in the area of Information, Electronics and Communications Technology (IECT). Currently, NIELIT has forty-three (43) centers across India. Several online courses are offered by the NIELIT.

MOOKIT (www.mookit.in)

In today's knowledge society, MOOC is a buzzword; the first requirement to deliver a MOOC effectively is a powerful platform. MooKIT is an open-source and lightweight MOOC Management software designed and developed at IIT Kanpur. MooKIT is a system that

instructors, learners, and system administrators find easy to work. Currently, more than 60 MOOCs are offered by this unique platform.



Glimpse of courses on MookIT Platform

7.9 POINTS TO REMEMBER

- Technology-enabled education aims to focus on increasing access to quality teaching and learning by supporting policy formulation and innovation in the application of ICT in education, and the development of ICT skills.
- Technology-enhanced learning (TEL) is concerned with using technologies to support learning whether the learning is local (i.e., on campus) or remote (at home or in the workplace).

7.10 GLOSSARY

- NIELIT- National Institute of Electronics & Information Technology.
- INFLIBNET- Information and Library Network.
- OSCAR- Open-Source Courseware Animations Repository.
- IRINS- Indian Research Information Network System.
- FOSSEE- Free/Libre and Open-Source Software for Education.
- CEC- Consortium for Educational Communication.

7.11 CHECK YOUR PROGRESS

Descriptive Type Questions-

- What are the benefits of Technology Enabled Education?
- List the tools used for technology enhanced learning.
- Shortly define the use of Virtual Labs for the learners.
- What is the use of ILearn portal? Define.

Objective Type Questions-

- The main goal of Project OSCAR (Open-Source Courseware Animations Repository) is to build a large repository of web-based, interactive animations and simulations, referred to as learning objects (LOs), for teaching only. (True/False)
- IRINS is web-based Research Information Management (RIM) service developed by the Information and Library Network (INFLIBNET) Centre. (True/False)
- FOSSEE (Free/Libre and Open-Source Software for Education) project promotes the use of FLOSS tools to improve the quality of education in our country. (True/False)
- VIDWAN is the premier database of profiles of scientists / researchers and other faculty members working at leading academic institutions and other R & D organization involved in teaching and research in India. (True/False)

Answers (Objective Type Question)

[a] False [b] True [c] True [d] True

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UNIT- 8

INTRODUCTION TO LEARNING MANAGEMENT SYSTEM

8.1 INTRODUCTION

8.2 OBJECTIVES

8.3 BENEFITS OF USING LEARNING MANAGEMENT SYSTEMS

8.4 LEARNING MANAGEMENT SYSTEM (LMS)- AN OVERVIEW

8.5 APPLICATIONS OF LMS

8.6 POPULAR LEARNING MANAGEMENT SYSTEM IN PRACTICE

8.7 HOW LMS USEFUL For EDUCATIORS?

8.8 AN INTRODUCTION TO MOODLE LEARNING MANAGEMENT SYSTEM

8.9 POINTS TO REMEMBER

8.10 GLOSSARY

8.11 CHECK YOUR PROGRESS

8.12 BIBLIOGRAPHY/ REFERENCES

8.13 SUGGESTED READINGS

8.1 INTRODUCTION

A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, automation and delivery of educational courses, training programs, or learning and development programs. The learning management system concept emerged directly from e-Learning. Although the first LMS appeared in the higher education sector, the majority of the LMSs today focus on the corporate market. Learning Management Systems make up the largest segment of the learning system market. The first introduction of the LMS was in the late 1990s.

Learning management systems were designed to identify training and learning gaps, utilizing analytical data and reporting. LMSs are focused on online learning delivery but support a range of uses, acting as a platform for online content, including courses, both asynchronous based and synchronous based. An LMS may offer classroom management for instructor-led training

or a flipped classroom, used in higher education, but not in the corporate space. Modern LMSs include intelligent algorithms to make automated recommendations for courses based on a user's skill profile as well as extract meta-data from learning materials in order to make such recommendations even more accurate.

8.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define the concept of Learning Management System.
- Brief description of application of LMS.
- Identify the list of popular learning management system.
- Explain Moodle platform (installation, managing accounts, defining roles, etc.)

8.3 BENEFITS OF USING LEARNING MANAGEMENT SYSTEMS

Following are the benefits of using Learning management System (LMS)-

Organizes and Safely Stores Big Data-

Learning Management Systems allow you to gather all Big Data in one location. This also makes it easier to maintain and update your learning materials. In addition, most LMSs offer advanced encryption so that you don't have to worry about data falling into the wrong hands.

Monitors Learner Progress and Performance-

Virtually all LMS platforms offer built-in reporting and analytics. Thus, you're able to track various aspects of your online training program. If the Learning Management System lacks sufficient reporting capabilities, you can typically purchase add-ons or plug-ins to boost its functionality. You can track everything from learner engagement to eLearning assessment results. This means that you can identify patterns and trends, especially since plenty of LMSs provide data visualizations, such as graphs and charts.

Improves Resource Allocation-

There are a number of ways that LMS software can help you allocate online training resources more effectively. First and foremost, you can identify aspects of your online training program that aren't meeting expectations. Low learner engagement is usually an indicator that you should reevaluate an online training module or activity. Secondly, Learning Management Systems help your eLearning team update online training assets more rapidly. Then there's the matter of deploying online training resources on a global scale. Thus, you have the power to keep corporate learners up to date using a single tool.

Personalizes the Online Training Experience-

You can assign different learning paths or online training resources for individual corporate learners with the help of an LMS. Therefore, everyone gets the individualized online training they require based on their learning goals, job duties, etc. There's even the option to unlock the navigation so that corporate learners can choose their own online training activities and coursework. All this translates into more effective online training experiences and increased learner satisfaction. Not to mention, improved memory retention and engagement.

Improves eLearning Accessibility-

Modern learners expect online training resources on demand. After all, we live in the digital age where information is always at our fingertips, thanks to smartphones and wearable tech. Learning Management Systems allow you to deploy and track online training courses without geographical limitations. So long as they can log into the system, corporate learners have the opportunity to expand their knowledge and hone skills.

Keep in mind that there is no one-size-fits-all LMS. Every organization has unique training needs and budgetary constraints. Thus, you should do your homework to find the LMS that meets your requirements and benefits both your corporate learners and bottom line.

8.4 LEARNING MANAGEMENT SYSTEM- AN OVERVIEW

Learning Management Systems (LMS) are the software hub of most online courses. In general, they have basic tools for assessment, communication, content management, data collection, and reporting. Some may have tools for both synchronous (same time) and asynchronous (not happening at the same time) communication. Online or blended courses are likely delivered at your university using a Learning Management System like- Moodle, Blackboard, Desire2Learn, Sakai, Canvas, etc.

Advantages-

There are six major advantages of LMS: interoperability, accessibility, reusability, durability, maintenance ability and adaptability, which in themselves constitute the concept of LMS. Some other advantages include:

- An LMS supports content in various formats: text, video, audio, etc.
- One can access materials anytime, from everywhere, teachers can modify the content, and students can see the updated material.
- The evaluation of students is easier and fair, based on student attendance and online quizzes.
- Students and teachers can re-use the material every time they need.

Students can learn collaboratively by setting up a school website with the LMS software and helps "Keeps organizations up-to-date with compliance regulations. If your organization must

stay up-to-date with current compliance regulations, then a Learning Management System can be an invaluable tool. Compliance laws change on a regular basis, and updating a traditional course to reflect these changes can be a time-consuming chore.

Disadvantages

- Implementing LMS requires a well-built technology infrastructure. Teachers have to be willing to adapt their curricula from face-to-face lectures to online lectures.
- LMS can often come across as impersonal and lacking in the dialogue opportunities provided by in-person training.

Who Can Benefit From LMS?

Learning Management Systems are beneficial for educational institutions and corporations alike. Extended enterprise online training is yet another application for Learning Management Systems. For example, companies are able to deploy online training resources to external sales channels, franchisees, and even customers. It's vital to identify your organizational and training objectives before you start the LMS selection process, as LMS vendors typically cater to different consumer groups. Some specialize in eCommerce, while others are known for their sales online training features.

Learning Management System Deployment Options

Cloud-Based (SaaS)

LMS software hosted on the cloud. The LMS vendor and their administrators will see to the maintenance of the system and carry out any tech upgrades or updates. Online learners and collaborators login to the Learning Management System with a user name and password. There's no need to install any software, which makes it a great option for businesses that want to get started as soon as possible. The best online learning platforms also offer various tools and options that can help you. The downside is that some cloud-based Learning Management Systems cannot be customized. For example, there are fewer opportunities to incorporate branding or personalize the dashboard.

Self-Hosted

LMSs that require software downloads. The LMS vendor can either offer direct downloads from their site or you must request physical software discs. However, the former is more common these days. Self-hosted LMS platforms allow for greater creative control and customization. The disadvantages are that you usually have to pay for updates and the system may require IT know-how.

Desktop Application

The LMS app is installed on the desktop. Some desktop apps are even accessible on multiple devices, making it easy for your entire eLearning team to collaborate.

Mobile Application

Learning Management Systems that are accessible whenever, wherever via mobile devices. You can upload online training content so that online learners can track online training initiatives on the go.

Licensing Options for Learning Management Systems

[1] Open Source

Open-source Learning Management Systems are generally free and based online. You're able to modify the source code in order to suit your needs. In addition, multiple open-source options have active online communities, which mean that you will be able to get tips and troubleshooting assistance if you do encounter a problem. The drawback is that you typically need some degree of programming experience.

[2] Free License

There are a number of free LMS options, usually open-source systems. However, the money that you save on licensing or monthly fees may be spent on IT staff, especially if you don't have any programming experience. In addition, you may have to deal with a steep learning curve to get the most from a Learning Management System.

[3] Paid License

Paid Learning Management Systems require a monthly or yearly fee. Some even allow you to purchase the software outright. They typically offer more advanced support options and user-friendly features.

Pricing Models for Learning Management Systems

Licensing

Instead of paying per user, this LMS pricing plan involves a licensing fee. Typically, an annual fee that you must renew on a yearly basis, or an outright upfront fee that grants unlimited lifetime access. However, as technology advances, you'll probably still have to purchase replacement software in the near future.

Subscription

A subscription fee usually grants you access to all LMS features or relies on a pay-per-user model. This pricing model involves a fee for each user, or active user. In some cases, the LMS vendor offers different price brackets. For example, the fee covers up to 25 active learners. This is a great solution for smaller organizations who try to minimize online training software costs, but still want to be able to scale the Learning Management System as their company expands.

Freemium

This LMS software is free for basic features but a fee is charged for more advanced functionalities, such as add-ons or upgrades, because of this, it is hard to include them when doing an LMS price comparison.

Perpetual License

If the software is a perpetual license LMS, you will only need to pay for it when you buy it. This saves you the cost of fees and subscriptions.

8.5 APPLICATIONS OF LMS

An LMS delivers and manages all types of content, including video, courses, and documents. In the education and higher education markets, an LMS include a variety of functionality that is similar to corporate but have features such as rubrics, teacher and instructor facilitated learning, a discussion board, and often the use of a syllabus.

Managing courses, users and roles

The LMS may be used to create professional structured course content. The teacher can add, text, images, tables, links and text formatting, interactive tests, slideshows etc. Moreover, you can create different types of users, such as teachers, students, parents, visitors and editors (hierarchies). It helps control which content a student can access, track studying progress and engage student with contact tools. Teachers can manage courses and modules, enroll students or set up self-enrollment, see reports on students and import students to their online classes.

With much of the integration of new resources being controlled by technical guidelines outlined by SCORM (Sharable Content Object Reference Model), the process of integrating new features within multiple LMSs has become more efficient.

Online assessment and tracking students' attendance

LMS can enable teachers to create customized tests for students, accessible and submitted online. Platforms allow different multiple question types such as: one/multi-line answer; multiple choice answer; drag-and-drop order; essay; true or false/yes or no; fill in the gaps; agreement scale and offline tasks. Some LMSs also allow for attendance management and integration with classroom training wherein administrators can view attendance and records of whether a learner attended, arrived late, or missed classes and events.

User feedback

Students' exchange of feedback both with teachers and their peers is possible through LMS. Teachers may create discussion groups to allow students feedback and increase the interaction in course. Students' feedback is an instrument which helps teachers to improve their work, identify what to add or remove from their courses, where students feel more comfortable, what makes them be more included.

8.6 POPULAR LMS IN PRACTICE

The LMS market is expected to be worth over \$15.72 billion in 2021. The highest proportion of revenue contribution is expected to be generated in North America. 41.7% of global Fortune 500 companies now use some form of educational technology to instruct employees during formal learning hours. Roughly half of all college classes will be eLearning-based. It is more than obvious that eLearning has revolutionized and changed the way we look at knowledge and skill acquisition. Thereby, there is an increasing demand for Learning Management Systems to systematically implement and manage eLearning.

Cloud-Based popular LMS in practice-

(i) Docebo (ii) Adobe Captivate Prime (iii) TalentLMS (iv) SAP Litmos LMS (v) LearnUpon LMS (vi) Inquisiq LMS (vii) LearningPool (viii) Mindflash (ix) Absorb LMS (x) iSpring Learn (xi) Looop (xii) LearnAmp (xiii) GnosisConnect (xiv) Coassemble (xv) Effectus LMS (xvi) Tovuti (xvii) Growth Engineering's Academy LMS (xviii) Skillcast LMS (xix) CoreAchieve

Open Source popular LMS in practice-

(i) Moodle (ii) Chamilo (iii) Open edX (iv) Totara Learn (v) Canvas

LMS Comparison: Cloud-Based Vs. Open Source LMS

Benefits of Using a Cloud-Based LMS-

If you opt for a cloud-based LMS solution, one of the pros you get is that no installation is required. This means that you have faster deployment. When it comes to budget, costs are based on each client's needs, making it more efficient and affordable in certain cases. In fact, a cloud-based LMS has considerably low start-up costs. A cloud-based LMS is hosted on the provider's server, offering data security and maintenance by the provider. You get advanced versions, which may include many more functionalities. Such an LMS is considered user-friendly and also helps you avoid IT hustle.

In addition, software updates are automatic, giving you extra features on a cost-free basis. It is also mobile-friendly since it is optimized for responsive design. A cloud-based LMS would be a better option for those looking to deliver online training to multiple locations. What's more, client support, offered by the provider's experts, is available 24/7, so you don't have to worry about maintenance and data security. Finally, it offers subscription plan scalability, making it cost-effective. The greatest thing about it is that most cloud-based LMS providers offer a free trial, so you can try and see if it covers your business needs in a decent amount of time.

Benefits of Using an Open Source LMS-

On the other hand, an open source LMS requires installation and setup. One of the main advantages of an open source LMS is that it is budget-friendly since you can find low-cost, but also free solutions as well. Most LMS tools come with a set pricing model, which might exceed

one's budget. An open source LMS is a great choice for small businesses and institutions that are looking for a budget LMS. This type of LMS is installed on the company's server, as a result, the user has to take care of maintenance and data.

However, if you opt for this type of LMS, you'll need to handle updates manually. Also, keep in mind that support can be found through forums and user communities. As any free thing on this planet, using a free LMS usually gives you limited features and courses. Also, you might not be able to have a large number of users. However, you'll still have a good overview of the software, making it a good, basic stand-alone solution. Since it is an open-source tool, there are options for modification and enhancements for its users.

Brief Introduction to popular Learning Management Systems in practice-

Canvas-

Through open, usable, cloud-based technologies, Canvas enables easy integration of the content, tools, and services that teachers need and students want. Not surprisingly, listening to users about their needs and wants then rolling out the most usable, customizable, adaptable, and reliable learning platform (think 99.9% uptime)—makes all the difference when it comes to campus-wide LMS adoption. That's why Canvas is adopted faster and deeper (or, is used in more ways by more users) than any other LMS. So, in the end, investing in 21st century education technology actually makes teaching and learning easier (like it's supposed to). Canvas is the educational revolution by Instructure, the technology company that makes smart software that makes people smarter. In addition to the Canvas learning management system (LMS), Instructure offers Canvas Commons, the learning object repository (LOR) that actually gets used; Canvas Catalog, the customizable, all-in-one course catalog, registration system, and payment gateway; and Canvas Network, an index of open, online courses taught by educators everywhere. Learn more about the expanding Canvas edu-ecosystem at www.CanvasLMS.com.

Blackboard Learn -

Blackboard Learn is a scalable, reliable foundation for a world-class learning experience. Our flexible learning platform enables you to extend online learning, increase employee engagement and optimize learning outcomes. Create and preserve institutional knowledge, retain top employees and drive business results with a better, more engaging learning environment. Intuitive new features make it even easier for you to manage content, personalize courses, foster collaboration, and connect with learners. Deliver instructor-led training and virtual learning that will keep learners engaged anywhere, at any time. Personal, intuitive, always-on, and connected

Google Classroom-

Classroom is a tool in Google Apps for Education that helps teachers create and organize assignments quickly, provide feedback efficiently, and easily communicate with their classes.

Schoology-

For over a decade, Schoology Learning has supported all instructional models, including 100% online courses and blended learning environments. As part of PowerSchool Unified Classroom™ solution, Schoology continues to ensure that all students have access to the same quality of teaching and learning, regardless of their socio-economic status, special education needs, or any other circumstances. Schoology, as part of PowerSchool, creates the most comprehensive unified classroom solution to equip teachers with personalized learning functionality to improve education outcomes for all students. Every day, millions of students, parents, faculty, and administrators from nearly 2,000 K-12 school districts leverage Schoology to advance what is possible in education. No matter if they're in the classroom or at home, Schoology provides communication tools to connect the teacher and student. With it, teachers can collaborate on shared curriculum so high quality, engaging learning experiences can be delivered district-wide, increasing overall equity and access.

Docebo-

The Docebo Learning Platform is trusted by global brands to create beautiful learning experiences. Complete with a robust content library at your fingertips with Docebo Content, the solution makes formal learning more engaging and opens new possibilities for social learning with Discover, Coach & Share. Docebo eliminates the need for multiple systems to deliver internal, cross-departmental and extended enterprise learning programs, all ready to scale alongside the growth of any business. The Docebo Learning Platform makes learning your competitive advantage

Edmodo-

Edmodo helps connect all learners with the people and resources needed to reach their full potential.

8.7 HOW LMS IS USEFUL FOR EDUCATORS?

Learning Management Systems enable an organization to effectively train a large group of individuals spread across the organization. With a Learning Management System, training and e-Learning are managed by software that allows users and administrators alike to easily access courses and training reports.

The following table identifies LMS tools and their definitions followed by some examples of how they might be used. Keep in mind that the tool names provided in the table may vary. As an Online TA you will need to know which tools are available in your learning management system and how to use them. You should be able to get that information from your University's computer/systems group and/or your Centre for Teaching Excellence.

Information delivery tools used as learning/assessment purposes-

Category	Tool	Description
Assessment	Blog	Allows students to document their learning experiences chronologically, share it with the instructor and classmates and provide feedback to one another.
	ePortfolio	Allows students to create a personalized web space with all their best work.
	Journal	Allows students to document their learning and share it with the instructors only.
	Quiz	Allows instructors to assess student learning by creating various types of questions (e.g., multiple choice, true/false, short answer).
	Self and peer assessment (aka Workshop)	Allows instructors to use student self-assessment and peer assessment.
	Wiki	Allows students to create and edit content pages as a group.
Communication	Chat	Allows students to synchronously talk to each other using text in a virtual chat room.
	Discussion Forum	Allows students to asynchronously comment using text or audio in a forum-type environment.
	Email / Internal email	Allows students to send emails while they are navigating the course content in LMS.
	News	Allows instructor to send course announcements.
	RSS	Allows students to subscribe to course updates. They will be notified via email when changes are made to content pages.
Content management / organizing	Calendar	Display all the important events (e.g., assignment due dates) in a calendar format.
	Checklist	Allows instructors to create checklists for students to proceed with their learning.
	Competencies	Allows instructors to create competencies for a course or program and monitor student achievement.
	FAQ	Allows instructors to create pages in a “frequently asked question” format.
	Glossary	Allows instructors to organize content in a glossary format.
	Lesson/Module	Allows instructors to organize content in sections, learning modules or units.
	Rubrics	Allows instructors to create rubrics.
SCORM	Allows instructors to upload SCORM content/objects.	
Data Collection / Reporting	Survey / Feedback	Allows instructors to survey students and collect information/feedback.
	Assignments / Dropbox	Allows instructors to assess student learning and provide feedback to their assignments.
	Grade book	Allows students to see their grades.

8.8 *AN INTRODUCTION TO MOODLE LEARNING MANAGEMENT SYSTEM*

Overview of Moodle Platform-

Moodle grown since 2001 as an open-source platform that empowers educators to develop and manage courses online. Moodle is a modular system based on plugins, which are like lego blocks that you put together to build whatever you want. There are plugins for different kinds of content, and plugins for all kinds of collaborative activities, which is where Moodle really shines. As an example, our Workshop plugin manages a full peer assessment process, so you can get hundreds of students accurately grading each other's assignments (that can save you a lot of time!). Add some tracking and reports and the ability to add more plugins from the community or even ones you write yourself, and you can build some pretty amazing education environments. The Moodle project is run by Moodle HQ from Perth, Australia, but would not be what it is without a huge community of users. Our community work together and help each other on moodle.org (itself a Moodle site), where they've taken Moodle's founding principles of feedback and collaboration online and practise it in our Moodle forums, our wiki-based Moodle Documentation, our Moodle Tracker for bugs and new features, our course-sharing site Moodle.net, and our Moodle Translation portal (which means you can use Moodle in over 100 languages!).

Key features of Moodle are-

- **Proven and trusted worldwide-** Powering hundreds of thousands of learning environments globally, Moodle is trusted by institutions and organizations large and small, including Shell, London School of Economics, State University of New York, Microsoft and the Open University. Moodle's worldwide numbers of more than 213 million users across both academic and enterprise level usage makes it the world's most widely used learning platform.
- **Designed to support both teaching and learning-** With over 10 years of development guided by social constructionist pedagogy, Moodle delivers a powerful set of learner-centric tools and collaborative learning environments that empower both teaching and learning.
- **Easy to use-** A simple interface, drag-and-drop features, and well-documented resources along with ongoing usability improvements make Moodle easy to learn and use.
- **Free with no licensing fees-** Moodle is provided freely as Open Source software, under the GNU General Public License. Anyone can adapt, extend or modify Moodle for both commercial and non-commercial projects without any licensing fees and benefit from the cost-efficiencies, flexibility and other advantages of using Moodle.

- **Always up-to-date-** The Moodle project's open-source approach means that Moodle is continually being reviewed and improved on to suit the current and evolving needs of its users.
- **Moodle in your language-** Moodle's multilingual capabilities ensure there are no linguistic limitations to learning online. The Moodle community has begun translating Moodle into more than 120 languages (and counting) so users can easily localize their Moodle site, along with plenty of resources, support and community discussions available in various languages.
- **All-in-one learning platform-** Moodle provides the most flexible tool-set to support both blended learning and 100% online courses. Configure Moodle by enabling or disabling core features, and easily integrate everything needed for a course using its complete range of built-in features, including external collaborative tools such as forums, wikis, chats and blogs.
- **Highly flexible and fully customizable-** Because it is open-source, Moodle can be customized in any way and tailored to individual needs. Its modular set up and interoperable design allows developers to create plugins and integrate external applications to achieve specific functionalities. Extend what Moodle does by using freely available plugins and add-ons - the possibilities are endless!
- **Scalable to any size-** From a few students to millions of users, Moodle can be scaled to support the needs of both small classes and large organizations. Because of its flexibility and scalability, Moodle has been adapted for use across education, business, non-profit, government, and community contexts.
- **Robust, secure and private-** Committed to safeguarding data security and user privacy, security controls are constantly being updated and implemented in Moodle development processes and software to protect against unauthorized access, data loss and misuse. Moodle can be easily deployed on a private secure cloud or server for complete control.
- **Use anytime, anywhere, on any device-** Moodle is web-based and so can be accessed from anywhere in the world. With a default mobile-compatible interface and cross-browser compatibility, content on the Moodle platform is easily accessible and consistent across different web browsers and devices.
- **Extensive resources available-** Access extensive Moodle documentation and user forums in multiple languages, free content and courses shared by Moodle users across the world, as well as hundreds of plugins contributed by a large global community.

Add Courses on Moodle LMS-

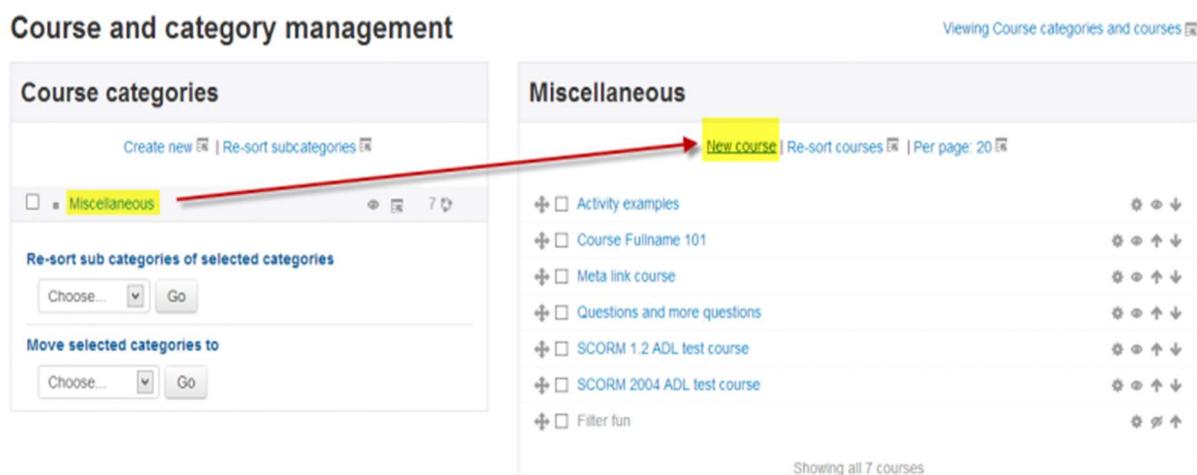
A course in Moodle is an area where a teacher will add resources and activities for their students to complete. It might be a simple page with downloadable documents or it might be a complex set of tasks were learning progresses through interaction.

The course page is made up of central sections which contain the tasks and (if desired) blocks to the side. The course teacher has control over the layout of the course homepage and can change it at any time. Progress can be tracked in a number of ways.

Students can be enrolled manually by the teacher, automatically by the administrator, or they can be allowed to enroll themselves. Students can also be added to groups if they need to be separated from classes sharing the same course or if tasks need to be differentiated.

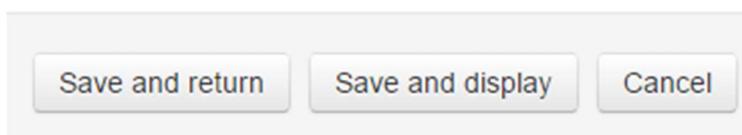
Adding a course

By default, a regular teacher can't add a new course. To add a new course to Moodle, you need to have either Administrator, Course Creator or Manager rights. To add a course: From the Site administration link, click Courses>Manage courses and categories



- Click New course in the category page on the right
- Click on the category where you want your course to be. For more information see Course categories
- Click the "New course" link

Enter the course settings, and then choose either to "Save and return" to go back to your course, or "Save and display" to go to the next screen.



On the next screen, if you have chosen "Save and display", choose your students/teachers to assign to the course.

Manage Courses on Moodle LMS-

Courses are the spaces on Moodle where teachers add learning materials and activities for their students. Courses may be created by admins, course creators or managers. Teachers can then add the content and re-organize them according to their own needs. The links below the image will provide more information about creating, organizing and managing courses.

Moodle

NAVIGATION

- Home
 - My home
 - Site pages
 - My profile
 - Courses

ADMINISTRATION

- My profile settings
- Site administration
 - Notifications
 - Registration
 - Advanced features
 - Users
 - Courses
 - Manage courses and categories
 - Add a category**
 - Course default settings

Add new category

Parent category

Top

Category name*

Science

Category ID number ?

Description

Paragraph B I Bulleted list Numbered list Link Unlink Image

All courses relating to General Science

Deleting a Course-

Teachers cannot delete courses. Managers (i.e., users with a role for which the capability Moodle/course: delete is allowed) can delete courses and course creators can delete courses they have created themselves, but only within 24 hours of creating the course. This is so that courses created by mistake may be deleted without needing to ask an administrator. Administrators can always delete courses. To delete a course (as an admin or manager):

- From the Site administration link, click Courses > Manage courses and categories
- Click the course's category and click the course in the screen on the right.
- Click the Delete link.

Course and category management

The screenshot displays the Moodle course management interface. It features three main panels:

- Course categories:** Includes options for 'Create new' and 'Re-sort subcategories'. A 'Miscellaneous' category is highlighted, showing 7 subcategories. A 'Re-sort sub categories of selected categories' section is visible with a 'Choose...' dropdown and a 'Go' button.
- Miscellaneous:** Contains a 'New course' and 'Re-sort courses' link, and a 'Per page: 20' setting. A list of courses is shown, including 'Activity examples', 'Course Fullname 101', 'Meta link course', and 'Questions and more questions', each with a plus icon and a settings icon.
- Activity examples:** Shows a list of activity examples with columns for 'Full name' and 'Short name'. A 'Delete' button is highlighted in the top right corner of this section.

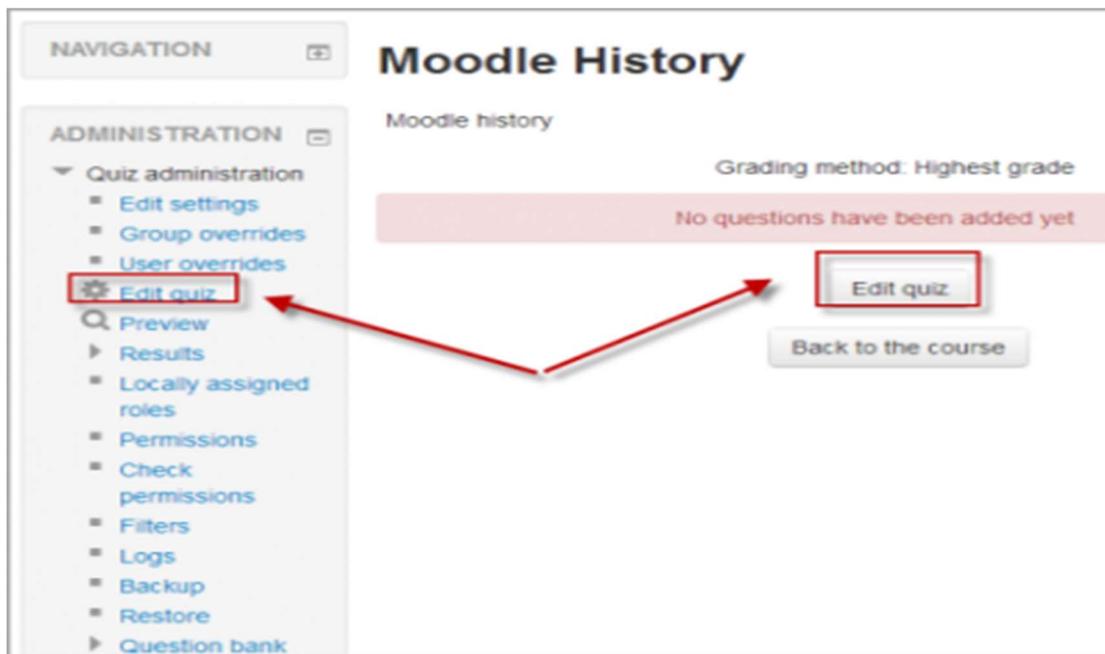
You can delete multiple courses by:

- Creating a new (temporary) category. You can name it "To be deleted".
- Select and move the "About to be deleted" courses to that category ("To be deleted").
- Delete the category ("To be deleted") and choose "Delete ALL - cannot be undone".

Add Assessment on Moodle LMS-

Moodle offers many different styles of assessment, from quizzes to workshops to lessons. Each offer different style of assessment for different users. Teachers may wish to encourage learners to self-assess, or may prefer more traditional quiz type assessments as part of formative assessment. This post offers instructional screencasts and documents on the various assessment options open through Moodle.

- On-line quizzes
- Submitting Assignments
- In class exams
- Peer assessment – Creating a workshop in moodle
- Group work
- Student generated content as an assessment
- Completing assignments and assessments through Moodle
- How do I grade my students' assignments?

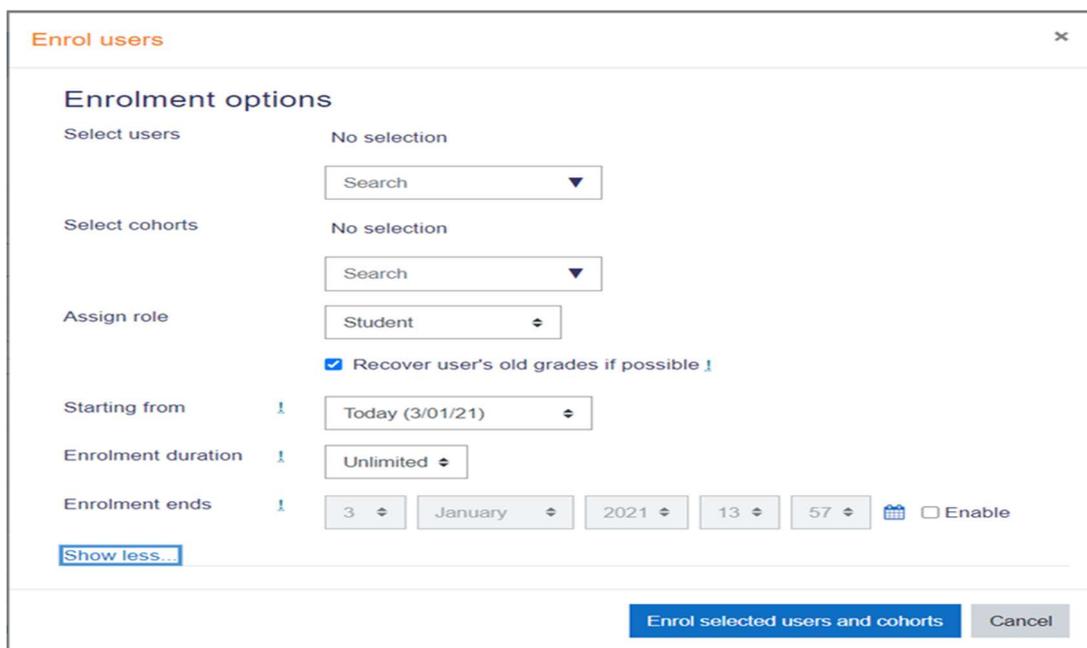


Enroll Participants on Moodle LMS-

The Participants page enables teachers to easily enroll, view, search for, filter, edit and delete course participants. The Participants page can be accessed from the navigation drawer in the Boost theme or the Administration block in other themes. It can also be accessed from the More link in the gear menu, by clicking Enrolled users in the Users tab.

Enrolling users

Users may be enrolled from the Enroll users button at the top right and bottom right of the screen.



Filtering and searching for users

The filter at the top left of the screen allows for filtering by period of activity, enrolment method, group, roles, status and keyword. More than one may be selected, with the option to filter 'Any' or 'All':

You can also search users by any of the fields defined in the "Show user identity" setting. Some of the searchable fields, such as username, first name and last name, allow you to use wildcards to represent one or more characters. There are two wildcards:

- % The percent sign represents zero, one, or multiple characters
- _ The underscore represents a single character (Note: MS Access uses a question mark '?' instead of the underscore '_'). These wildcards can be escaped, if needed, to search users containing them, using a backslash '\':
- A_B will find all the users starting with an A, followed by any character and then B (i.e., Ax B or A2B, but not AxxB).
- A_B will find users starting exactly with 'A_B'.

It is possible to bulk select, edit and delete users who have self-enrolled, in a similar way to users who have been enrolled manually.

Roles-

- To assign an enrolled user a role, click the pencil icon in the Roles column then select the desired role and click the save icon to confirm the change.
- To remove a role assignment, click the delete icon (a cross) next to the role name.
- Only roles which can be assigned in the course context type are available to select. The course context type may be set by an admin by editing the role via Site administration > Users > Permissions > Define roles.
- Only roles which a user is allowed to assign are available to select.

8.9 POINTS TO REMEMBER

- A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, automation and delivery of educational courses, training programs, or learning and development programs.
 - An LMS delivers and manages all types of content, including video, courses, and documents.
 - Moodle is a modular system based on plugins, which are like lego blocks that you put together to build whatever you want.
 - A course in Moodle is an area where a teacher will add resources and activities for their students to complete.
 - Moodle offers many different styles of assessment, from quizzes to workshops to lessons. Each offer different style of assessment for different users.
-

8.10 GLOSSARY

- LMS- Learning Management System
 - LOR- Learning Object Repository
 - SCORM -Sharable Content Object Reference Model
-

8.11 CHECK YOUR PROGRESS

Descriptive Type Questions-

- a) What is Learning Management System?
- b) List all popular learning management system.
- c) How LMS useful for educators?
- d) Define MOODLE learning management system.
- e) How to add course in MOODLE learning management system.

Objective Type Questions-

- a) A learning management system (LMS) is a software application for the administration, documentation, tracking, reporting, automation and delivery of educational courses, training programs, or learning and development programs. (True/False)
- b) Learning Management Systems allow you to gather all Big Data in different location. (True/False)
- c) An LMS delivers and manages all types of content, including video, courses, and documents. (True/False)
- d) A course in Moodle is an area where a teacher will add resources and activities for their students to complete. (True/False)

Answer (Objective Type Question)-

- [a] True [b] False [c] True [d] True

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UNIT- 9

INTRODUCTION TO CONTENT MANAGEMENT SYSTEM

9.1 INTRODUCTION

9.2 OBJECTIVES

9.3 CONTENT MANAGEMENT SYSTEM

9.4 WORDPRESS- A BRIEF INTRODUCTION

9.5 WORDPRESS DASHBOARD

9.6 CREATE A WORDPRESS WEBSITE / BLOG

9.7 WORDPRESS POST

9.8 WORDPRESS LINKS AND GOOGLE MAP IN WORDPRESS

9.9 POINTS TO REMEMBER

9.10 GLOSSARY

9.11 CHECK YOUR PROGRESS

9.12 BIBLIOGRAPHY/ REFERENCES

9.13 SUGGESTED READINGS

9.1 INTRODUCTION

The digital marketing approach focused on creating and distributing valuable, relevant and consistent contents to attract and retain valuable customers. The content can be defined as the information produced through editorial process. The contents can be texts, images, graphics, sound, video etc. A website plays an important role to boosting a business of an organization. However, website development means internal knowledge of programming or coding. But a new concept called content management system (CMS) makes it easy to create, edit and update the contents of a website. With the help of CMS, the user is able to maintain a website without having any knowledge of web development.

9.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define the Content Management System (CMS).
- Define the structure and types of CMS.
- Define the WordPress basics.
- Explain how to create a website/blog in WordPress.
- Describe how to add a post, link and other contents using WordPress.

9.3 CONTENT MANAGEMENT SYSTEM

Content Management System (CMS) is application software that provides an easy environment or platform to manage our digital content data such as text, images, audio, video, documents etc. CMS is multiuser, server-based software that interact with contents stored in a database. It provides some level of automation for the tasks required to efficiently manage contents. Content refers to the type of information that the CMS will allow us to manage.

A content management system (CMS) consists a database which organizes and provides access to all types of digital contents. CMS allow the user to control the structure of the website and makes the view of the webpages more attractive. A CMS allows editors to create new contents, edit existing contents, perform editorial processes on contents and make the contents available to other peoples. With the help of CMS, we can manage and control all types of contents virtually. The users with no knowledge of programming languages can easily use the features of a CMS and create web pages or websites.

Structure of CMS

A CMS consist two major components:

[1] Content Management Application (CMA): It is a front-end user interface which is used to create and design the web pages using drag and drop features. It helps the user to add, modify and delete contents from the web pages.

[2] Content Delivery Application (CDA): CDA is responsible for compiling the information and updating the webpages. It acts as the back-end portion of the website. It takes the contents entered by the creator through user interface and turning them into a effective website that the visitor or other users can access.

Types of Content Management System

Content Management System can be classifying as:

[1] Component Content Management System (CCMS)

[2] Document Management System (DMS): DMS allow a paperless solution to organize, manage, store and track documents in a cloud. It provides an automated solution for uploading, processing and sharing business documents without printing, copying or scanning.

[3] Enterprise Content Management System (ECM): ECM collects, organizes and delivers an organization's documentation.

[4] Web Content Management System (WCMS): It allows the users to manage digital components of a website without any need of highly technical skills or web programming. It uses templates in which the editor can insert images, text and videos to be published onto the website.

[5] Digital Asset Management System (DAM): DAM allows the user to manage media files such as videos, photos, graphics and other multimedia contents.

Benefits of CMS

- Easy and quick page management.
- Consistent navigation.
- Flexibility for user or editor.
- Keep design separate from contents.
- Database driven.
- Resource sharing.
- Remote access.
- Security.
- Search engine friendly.

9.4 WORDPRESS- A BRIEF INTRODUCTION

WordPress is free and open-source software package that work as a content management system (CMS). WordPress makes easy to setup, manage and maintain a blog or a website without any technical expertise. It includes all the tools and features we need to publish a blog or a complete web site. With the help of WordPress, we can manage several types of contents including posts, pages, links, widgets etc. WordPress started its journey in 2003 and now the most popular self-hosting tool. It is based on PHP and MySQL. Due to its features, it becomes a most popular CMS tool.

Brief History of WordPress

WordPress was released on 2003 by its founders Mike Little and Matt Mullenweg. It is written in PHP language with MySQL. WordPress first version 0.7 was released on May 27, 2003. Next version 0.1 was released in January 2004 which is called Davis Version. WordPress is expanding day by day and adding more features in its each version.

Features of WordPress

- Creating a website or blog without the knowledge of programming languages.
- Provide a wide range of themes.

- Free and open-source application i.e., it allows free installation, modification and distribution of its source code to others.
- Plugins are used to add extra functionality.
- It provides all types of blog solutions.
- WordPress makes easy to upload a multimedia files like videos, audios or images.
- Easy to use with GUI interface.
- WordPress is secure and mobile friendly.

WordPress Installation

System Requirement for WordPress-

[1] Database: MySQL 5.0+

[2] Web Server: WAMP (Windows) or LAMP (Linux) or XAMP(Multi-Platform)

[3] Operating System (Cross-Platform Supported) [4] Browsers: Internet Explorer 8+, Firefox, Google Chrome, Opera, etc.

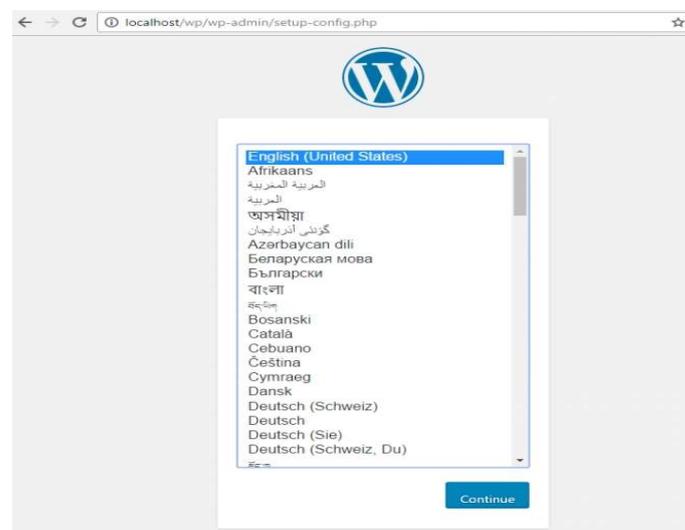
[5] PHP Compatibility: PHP 5.2+

Download WordPress-

WordPress is free and open-source platform under the GNU General Public License (GPL) and can be easily downloaded from WordPress official website through the link- <http://wordpress.org/download/>

WordPress Installation Steps

- [1] Extract the downloaded file and upload into your local host or web server project folder.
- [2] Open web browser and navigate the URL of the WordPress folder path. In local host the URL is “ http://localhost/wordpress_project_folder_name “
- [3] Create MySQL database.
- [4] WordPress Setup wizard requires some initial information about your website as follows:
Step 1- Choose the language and press continue.



Step 2- Enter the information related to the MySQL database. List of fields are-

- Database Name – Name of the database created in MySQL.
- User Name – User name for database
- Password – Enter the password for MySQL database.
- Database Host: Enter the host. By default, it is localhost.
- Table Prefix – Add prefix in the database tables.

After filling all the information press the submit button.

Step 3- now the setup checks the authentication of database and acknowledge with a confirmation.

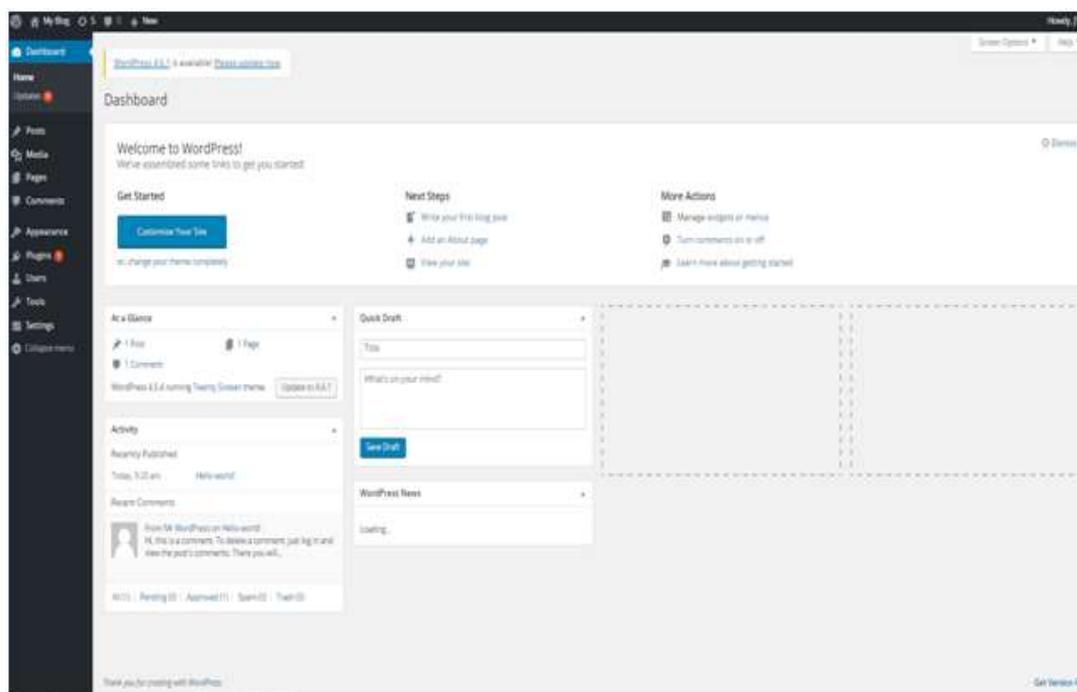
If the MySQL credentials are correct then a new screen comes up with the option “Run the install”. Click on “Run the Install” button.

Step 4- The final step of installation is to provide site admin information such as- Title of the site, User name, Password, Email Address, and Search engine visibility check box.

After filling the data click the “install WordPress” button.

9.5 WORDPRESS DASHBOARD

WordPress dashboard is a first screen which seen when login to admin. WordPress dashboard allows full access to manage a website or blog. The contents are grouped into widgets in dashboard. We can hide or show these widgets as required.



Various contents of dashboard are-

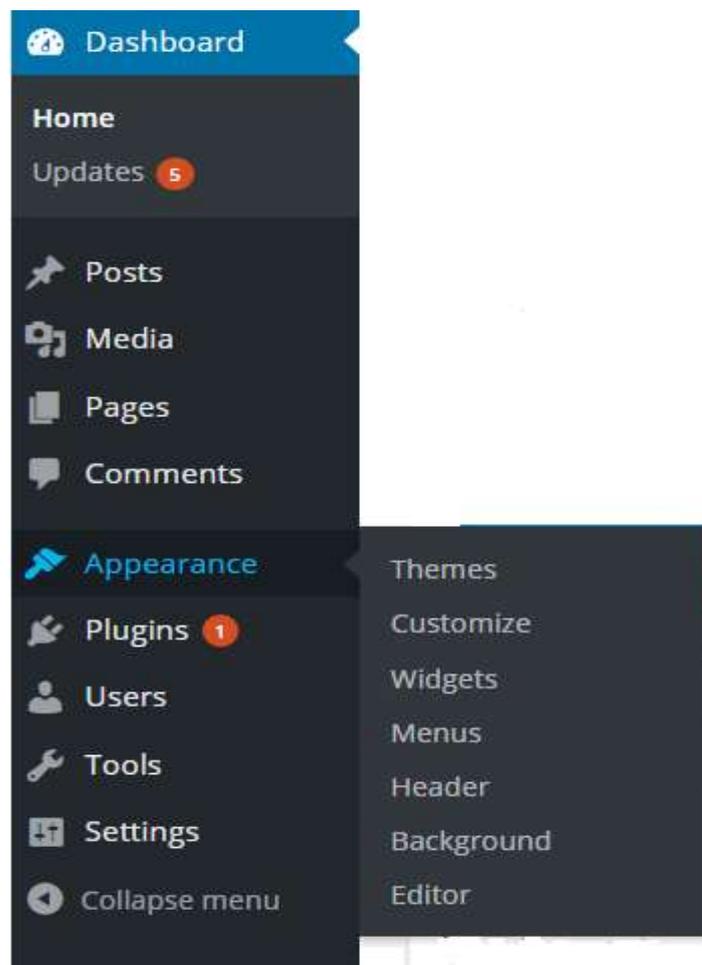
[1] **Admin Bar:** The top black bar is admin bar. It displays only when admin is logged in.



The admin bar contains following items:

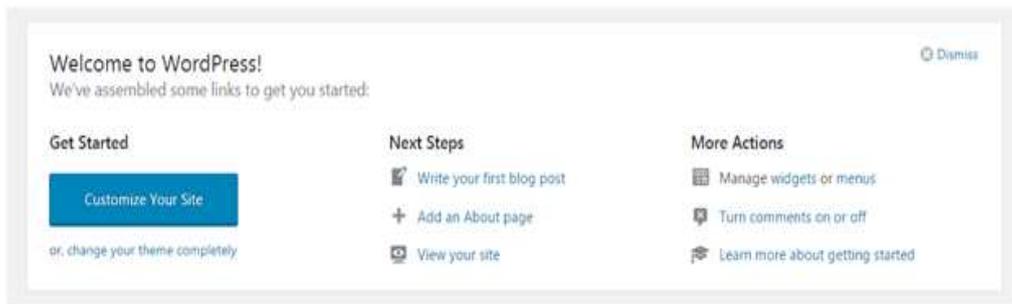
- A WordPress Icon
- Home of site
- Notifications
- Comments
- New (add up new page, post, user etc.)
- Admin name

[2] Sidebar Menu: Side bar of dashboard contain full menu of options for easy access to different areas of website.



Menu items in the sidebar are- Dashboard, Posts, Media, Pages, Comments, Appearance, Plugins, Users, and Tools

[3] Welcome to WordPress: In the top middle of dashboard “Welcome to WordPress” is displayed. It contains a “Customize your site” button allow the user to use different themes. Also create different links to create blog, view site and many more options.



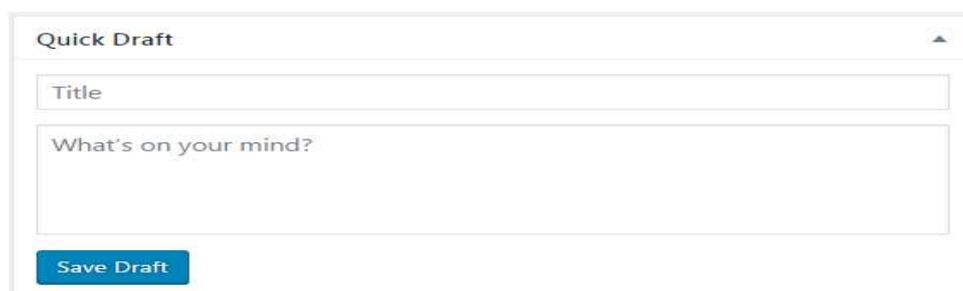
[4] **At a Glance:** It tells us how many posts, comments and pages are in our site.



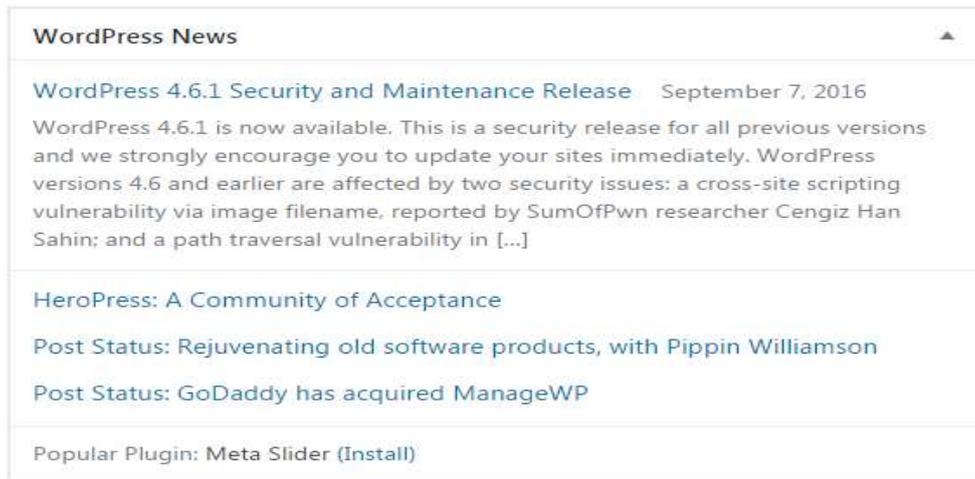
[5] **Activity:** It provides information about some of recent posts and display recent comments on posts.



[6] **Quick draft:** This feature allows us to write our ideas and save it in a draft form.



[7] **WordPress News:** All the latest blog posts from the WordPress official blog are displays in this section.



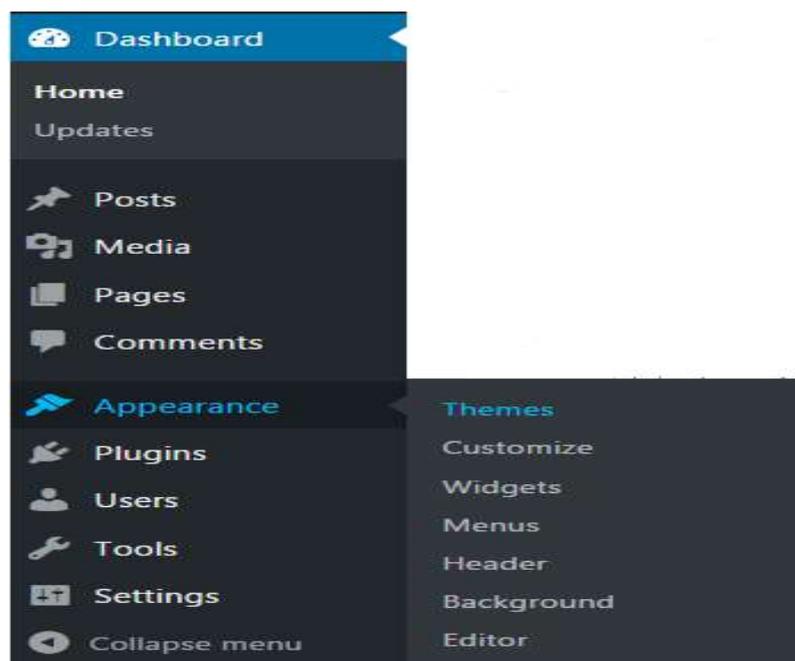
[8] Screen Option: Screen options allow us to enable or disable different widgets on dashboard area.

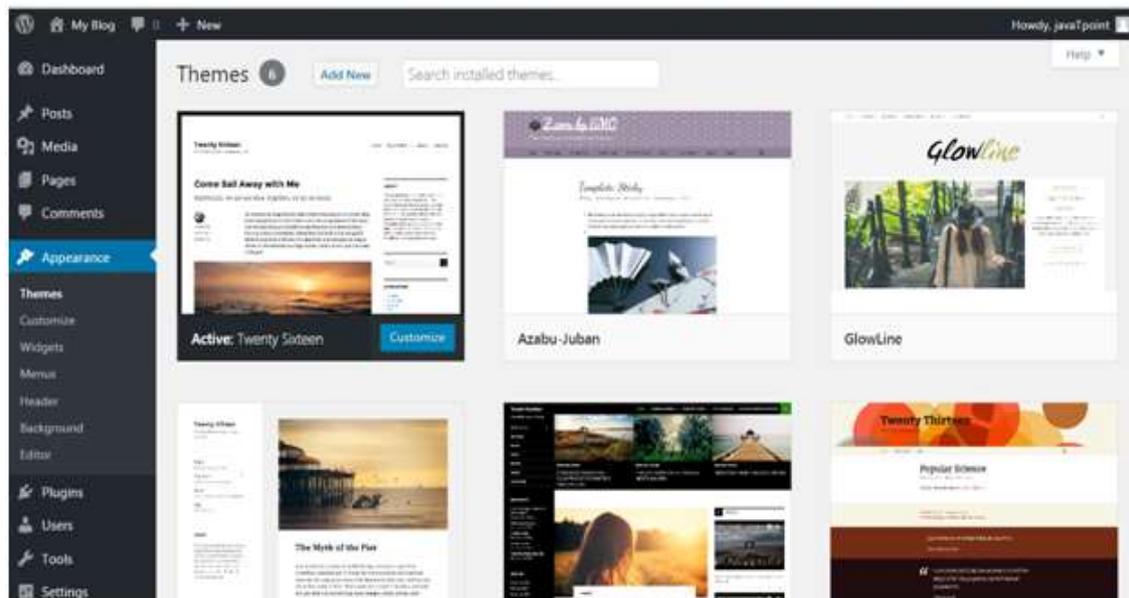
9.6 CREATE A WORDPRESS WEBSITE / BLOG

WordPress provides an easy platform to design and create an attractive website. Steps involved in creating a website through WordPress are:

Step 1- Choosing a domain name and host: To publish the website online we need to register a domain name. Domain name should be short and easy to remember.

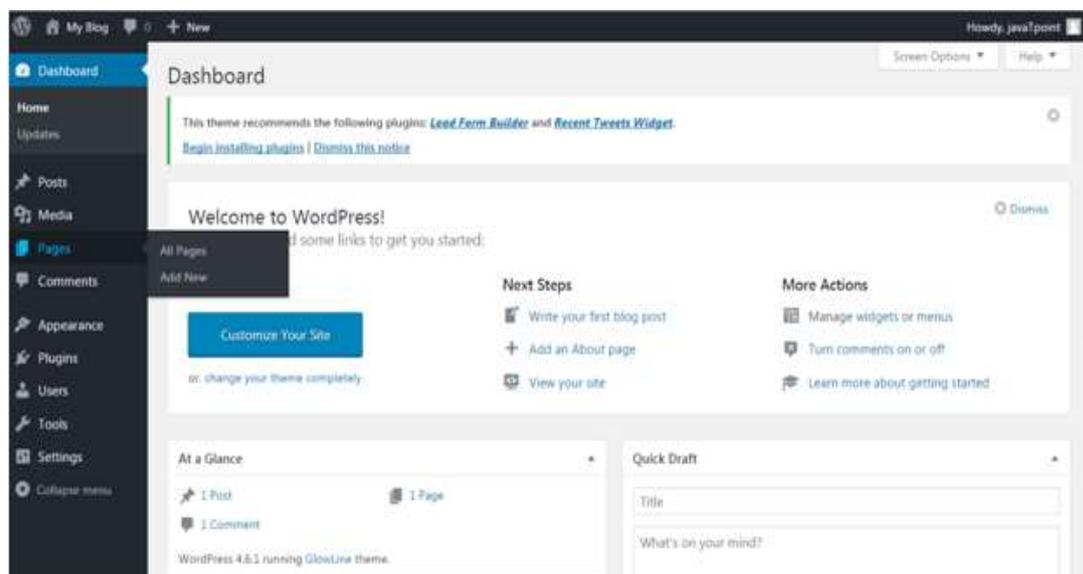
Step 2- Choosing a theme/template: To use themes or templates for your site, login to your WordPress site. By default, dashboard is the first screen to be displayed. In WordPress there are more than 150 free themes. To access free themes “go to the side bar menu of dashboard”, select Appearance > Themes



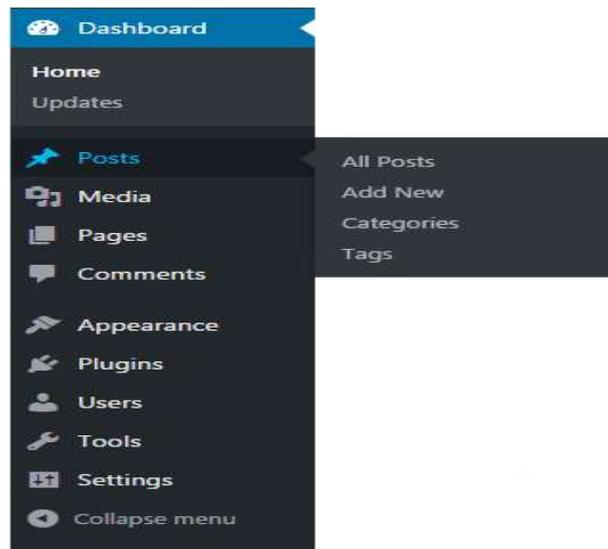


For more themes click on “Add New” button. To install a theme, click on install followed by Activate button.

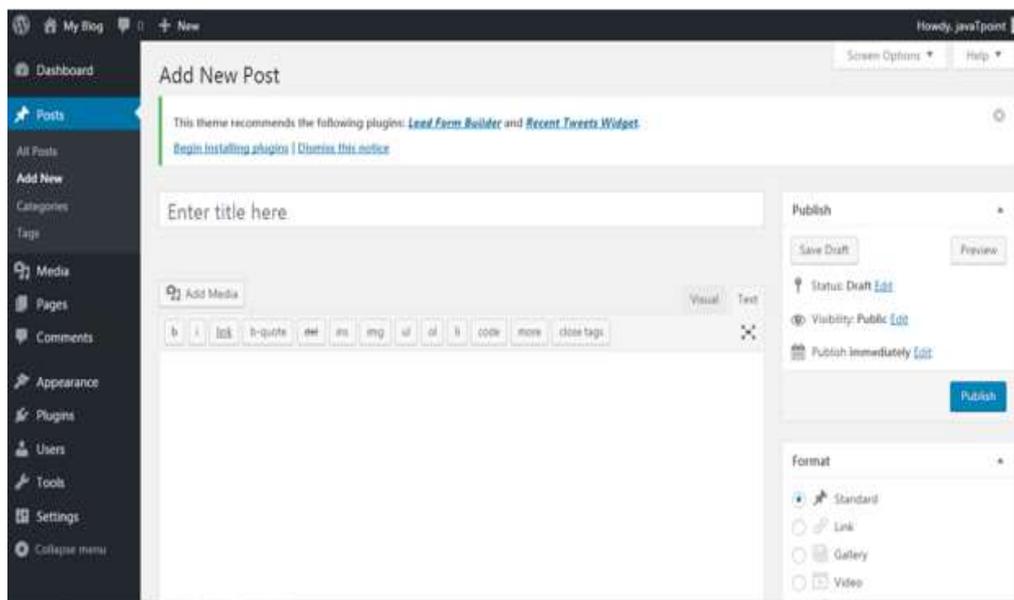
Step 3- Creating new pages: To create a new page, go the sidebar menu. Click Pages > Add New option.



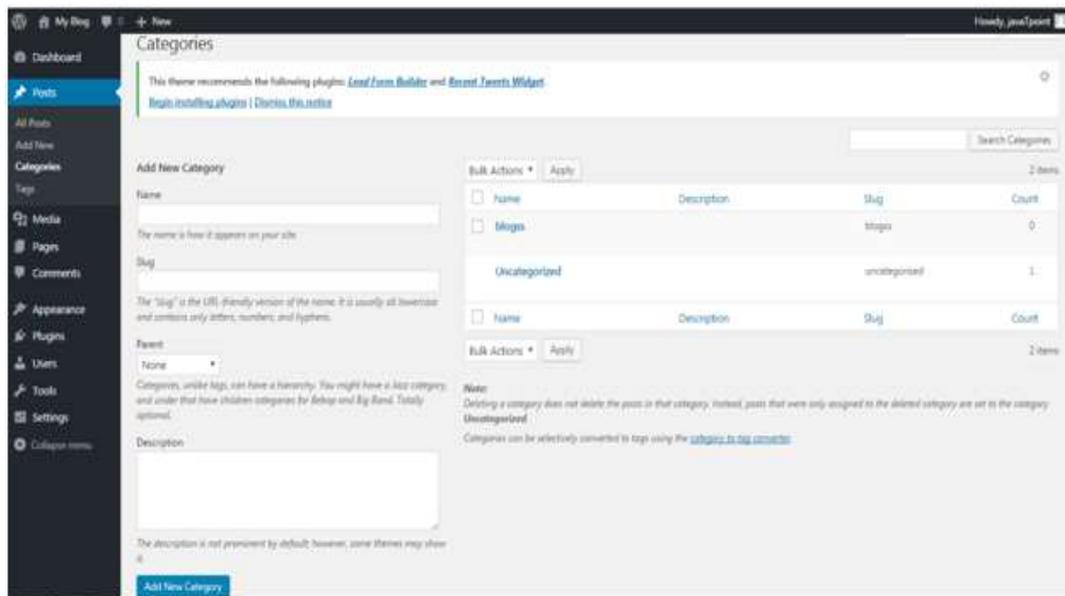
Step 4- Adding Content: (i) Adding new post



Posts are required to make our site more popular. To add posts, click on Post > Add New option. There are two ways to write a post, either in visual editor or in text editor.

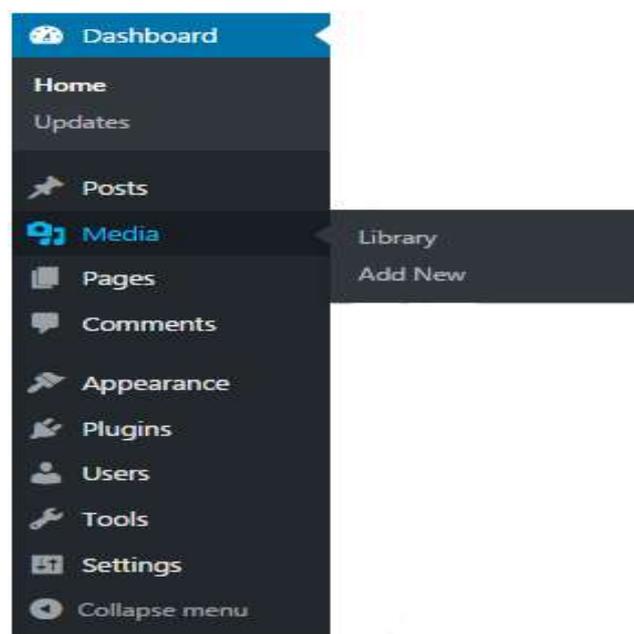


(ii) Adding Categories: With this feature we can divide our contents in different categories. This tool is very useful when we are publishing contents for more than one field. To add categories. Click on Posts > Categories.

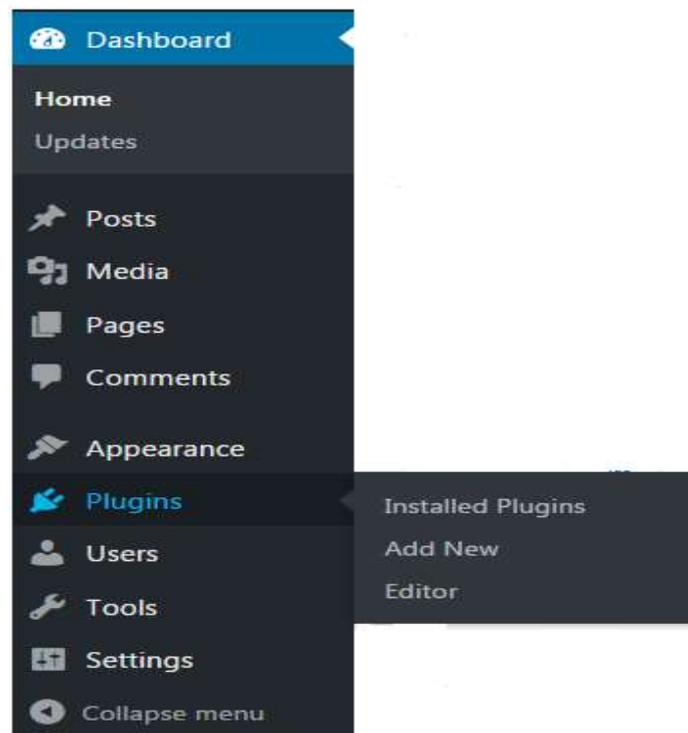


Here, the Name adds a title to your new category. In Slug, you can add some words which will become part of URL while searching.

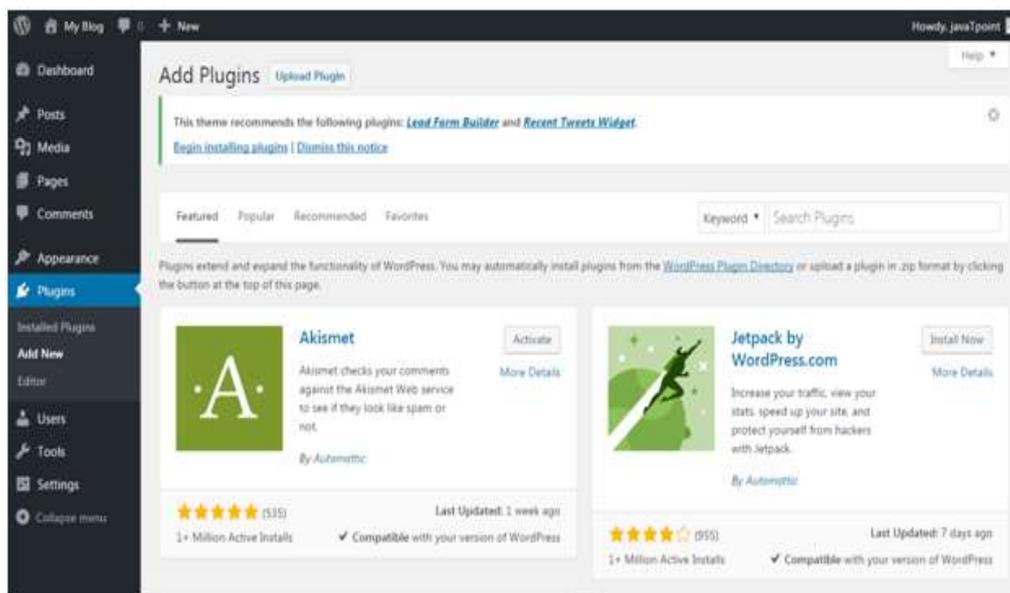
Step 5- Adding Media: Websites look attractive by using media files such as photos and videos to describe its contents. WordPress provides functionality to add media. To add media in website, click on Media on sidebar menu.



Step 6- Installing plugins: Plugins are the extensions in the WordPress with certain piece of coding expanding specific function to your site. They are not built-in. There are almost 25,000 different plugin options to choose from.



To install a plugin, click on Plugins > Add New.



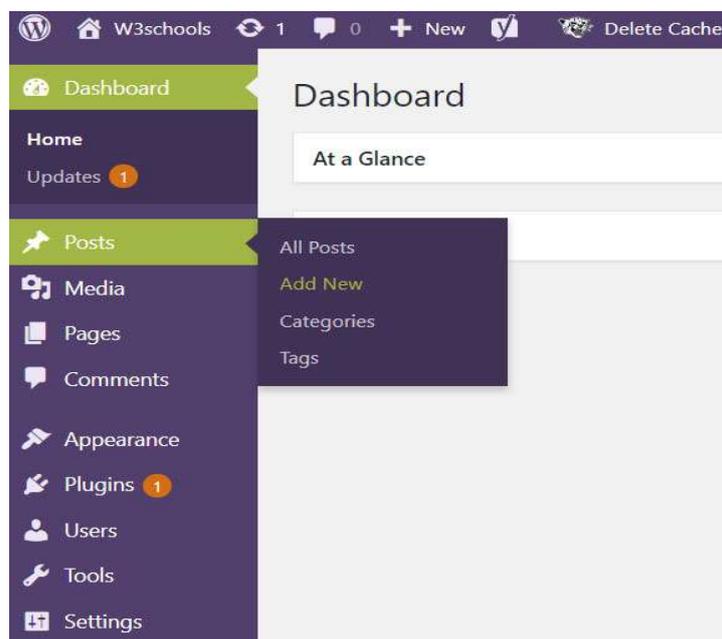
Now we can choose a plugin from the given options. Just click Install Now and we will be able to use it.

9.7 WORDPRESS POST

One of the common activities of WordPress admin user is to insert contents such as text, multimedia or other contents by adding posts in WordPress. Putting contents on website is done using this feature of WordPress. Post is a component of WordPress that allow users to inscribe a blog and post its contents on website.

Adding a New Post: To add a new post on the website through WordPress, we have to login to WordPress account. After login follow the below steps:

- Go to the sidebar menu on the left of dashboard.
- Click on Post > Add New
- Now a new screen will appear where we can give the option to add a title and contents for our page. There are two main components
 - 1) Title: Insert the title of the post.
 - 2) Content: Where we can write the contents of the post. It can be done by two different ways. The first is visual mode where we can write contents in regular format using WYSIWYG editor. The second one is text mode where we can write in HTML format.



Publishing a New Post:

When a post is created, the next step is to publish the contents of the post. For this click on the publish button available on the right side of the panel. List of the components that comes under the publish section is:

- Save Draft- used for saving post as a draft.
- Preview- is used for previewing the post before publishing.
- Move to Trash- used for deleting the post.
- Status- for changing the status of the post whether it is published, pending or under draft.
- Visibility- is used to modify the visibility of the post to public, private or password protected.
- Published- is used for changing the published post time and date.

Edit Existing Post: To edit a post go to “Posts > All Posts”. This will provide a list of all created posts. Move the mouse on any post; you will see an option for Edit and Quick Edit.

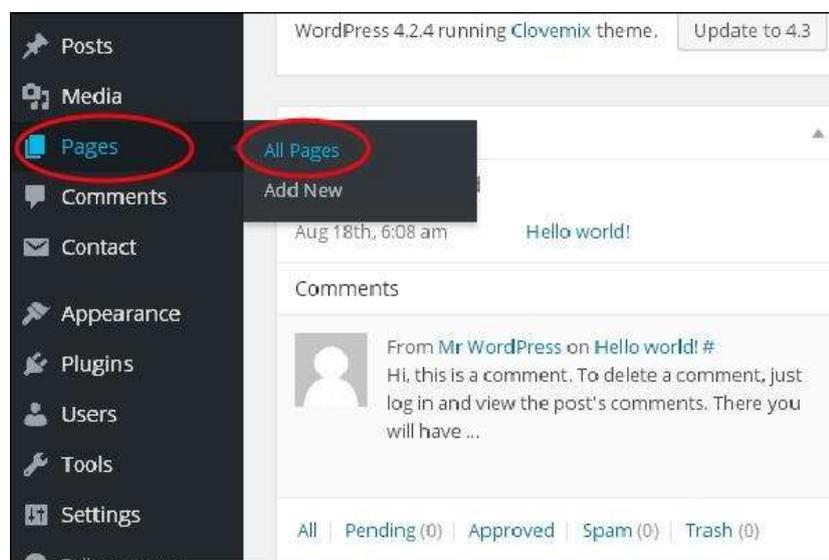
Delete Existing Post: To Delete a post go to “Posts > All Posts”. This will provide the list of all posts. Move mouse on any post you will see a link of Trash. The trash option allows us to delete the particular post.

9.8 **WORDPRESS LINKS AND GOOGLE MAP IN WORDPRESS**

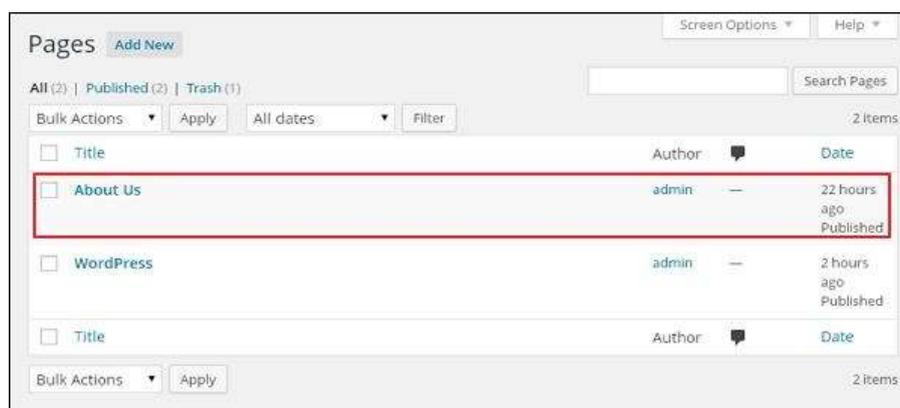
In webpages links are used to connect one resource to another resource. A link in a page or blog posts help to connect to other pages.

Add WordPress Links- Steps to add links in WordPress are-

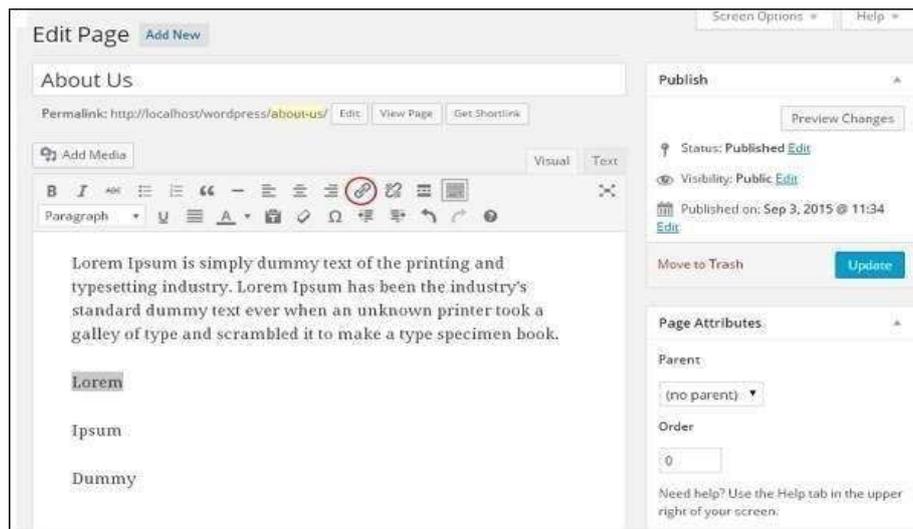
Step 1- Click on “Pages > All Pages”



Step 2- A new window get displayed which provide the list of created pages. Select any page to add links inside it.



Step 3- Select any of the word or sentence where we want to add link.



Step 4- When we click on the Insert / Edit link symbol, the following window gets displayed.

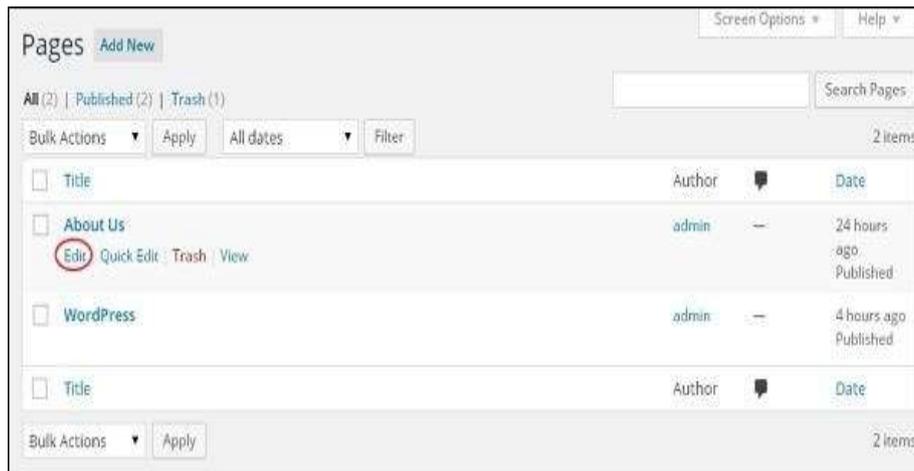
The various fields in insert/edit link are

- URL: Enter URL to the link.
- Link Text: Insert text we want to enter into the link.
- Open link in a new window/tab: check the box as required.

Now click “**Add Link**” button and then **Update** button to update the changes.

Edit Links- Steps to edit links in WordPress

- 1) Click on “Pages > All Pages”
- 2) A new window provides a list of all the created pages. Move the cursor on the page to be edited. It gives the option of Edit, click on “Edit”.



3) It displays the page which contains the link. Move the cursor on the word which has a link, it shows a pencil symbol to edit the link. Click on it.

4) You can change or edit link by selecting the page from the existing list. After selecting the page click on Update button.

Delete Links- Using WordPress we can remove the unwanted links from our websites or articles. Steps to delete the links in WordPress are-

Step 1- Click on “Pages > All Pages”,

Step 2- A new window shows the list of all created pages. Move the cursor on the page which has the link to be deleted. Click on the “Edit” button to delete the link.

Google map in WordPress-

Google map is a free online mapping and navigation application for desktop and mobile devices from Google. We can use Google maps to get step by step directions, find information about locations and local businesses etc. The Google map can be added in our webpage or blog through WordPress in following two ways.

Directly Embed Google Maps in WordPress: The simplest way to add Google Maps in the WordPress post or website is by directly using an Embed Code provided by Google itself. To use this feature, first open Google Maps, and then search for location or required place. Then click on the “Share” button and then on the “Embed Map” option. Now choose the size required for your Google map and copy the given Embed code.

Once we have the embed code, we can insert the code as an HTML block into our post. To do so, click on the plus icon to add a block and look for custom HTML block under the formatting section. Now paste the embed code here. After saving the post, the map is shown in the post.

Adding Google Maps in WordPress using a Plugins: If the maps are the important content of website and we need to frequently add maps in our posts, then adding Google Maps using a plugin is recommended.

For this feature first we need to install and activate Map Press Easy Google Maps plugin. Edit a post or page where we want to add the map. Scroll down to Map Press section on the post edit screen and click on “New Map” button. This will open Map Press editor where we can enter an address or click on my location link to allow plugin to automatically detect your location. Now provide the title to your map and choose the map size. Now click on the “Save” button and then click on “Insert into Post” button to add the map into your post. Update or publish the post and see the preview. With Map Press we can add multiple maps to a page or post.

9.9 POINTS TO REMEMBER

- Content Management System (CMS) is application software that provides an environment to manage digital contents such as text, images, audio, video etc.
- CMS consist a database which organizes and provides access to all types of digital contents.
- The main objective of a computer network is sharing of information, resources and distributes the processing load.
- Content Management Application (CMA) and Content Delivery Application (CDA) are the main components of CMS.
- CMA is the front-end user interface which is used to create and design web pages.
- CDA act as the backend portion of website which is used for compiling the information and updating web pages.
- CMS can be classified as (1) Component Content Management System (CCMS), (2) Document Management System (DMS), (3) Enterprise Content Management System (ECM), (4) Web Content Management System (WCMS), (5) Digital Asset Management System (DAM).
- The most popular open-source software which works as a CMS is WordPress.
- WordPress makes easy to setup, manage and maintain a blog or a website without any technical expertise.
- WordPress is based on PHP and MySQL.
- WordPress was released on 2003 by Mike Little and Matt Mullenweg.
- WordPress dashboard is the first screen which seen when login to admin and allows full access to manage a website or blog.

9.10 GLOSSARY

- **Digital Marketing-** Digital marketing is a type of marketing which uses the internet, computer, mobile devices, search engines and other channels to reach the consumers.
- **Contents-** Content can be defined as the information available on digital media such as text, images, sound etc.
- **Database-** A database is an organized collection of structured information or data stored

in a computer system.

- **Programming Languages**-The languages or syntax which are used to write instructions or programs for computer are called programming languages.
- **Graphical User Interface (GUI)**- The graphical user interface provides an interface through which the user can interact with the electronic device.
- **Remote Access**- Remote access is the ability to access a computing device that is not in your physical location.
- **Open-Source Software**- Open-source software is software with source code that the end user can inspect, modify and enhance.
- **General Public License (GPL)** - The GNU General Public License (GPL) is a series of widely used free software licenses that guarantee end user the freedom to run, study, share and modify the software.

9.11 CHECK YOUR PROGRESS

Objective type Questions-

- a) CMS stands for
- b) The relational database used by WordPress is
- c) WordPress is written in programming language.
- d) WCMS stands for
- e) is the first page which is displayed after logging into a webpage in WordPress.

Descriptive type questions-

- a) What is a content management system? Describe the benefits of CMS?
- b) What is WordPress? Describe the features of WordPress?
- c) What is the use of Quick Draft Section in WordPress dashboard?
- d) What is WordPress post? How a new post is added in the WordPress?
- e) Describe the steps to create a website or blog in WordPress?

Answers (Objective type Questions)-

- a) Content Management System b) MySQL c) PHP
- d) Web Content Management System a) Dashboard

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UNIT-10

AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

10.1	INTRODUCTION
10.2	OBJECTIVES
10.3	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING- AN OVERVIEW
10.4	APPLICATIONS OF ARTIFICIAL INTELLIGENCE
10.5	FUTURE TRENDS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
10.6	ARTIFICIAL INTELLIGENCE PROGRAMMING LANGUAGES
10.7	POPULAR MACHINE LEARNING METHODS
10.8	POINTS TO REMEMBER
10.9	GLOSSARY
10.10	CHECK YOUR PROGRESS
10.11	BIBLIOGRAPHY/ REFERENCES
10.12	SUGGESTED READINGS

10.1 INTRODUCTION

Artificial Intelligence is helpful to develop or design smart machines. It is able to design self-learning software applications. This software can perform reasoning, problem-solving, planning, optimal decision making, sensory perceptions and many more functions. The Artificial Intelligence is helpful for humans to improve their decision making. The Artificial Intelligence is basically related knowledge discovery. (Source: <https://www.educba.com/introduction-to-artificial-intelligence/>)

In Artificial Intelligence the Intelligence means the ability to learn and solve problems. Today we are making computers more and more intelligent. We are trying that the computer could act as intelligent as humans. Now computer can solve real-world problems. Due to Artificial Intelligence, it can improve its performance by its past experiences. The Artificial Intelligence based systems have the ability to think and decision making.

***NOTE-** Artificial intelligence is a subject like Biology, Psychology, Linguistics, Mathematics, and Engineering. The major functions of artificial intelligence are reasoning, learning, and problem solving. Following are the main objectives behind the learning of Artificial Intelligence-*

- *Now Artificial intelligence trying towards that machine can think.*
- *Artificial intelligence aims to Create Expert Systems. The expert systems always exhibit intelligent behaviour. It can learn, demonstrate, explain, and advice its users.*
- *Artificial intelligence aims to Implement Human Intelligence in Machines. It can create systems to understand, think, learn, and behave just like humans.*
(References:
https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_overview.htm)
- *Initially Artificial intelligence was used to develop reasoning and problem-solving skills. The goal of Artificial intelligence to make knowledge representation easy. It means representing information such a way that machine or computer can understand it.*
- *The main goal of Artificial intelligence is to develop intelligent machines. So, the goal of Artificial Intelligence system is to learn and memorize of data.*
- *The goal of artificial intelligence is to develop machines which can read and understand human languages. The Natural learning processing is the real future of Artificial Intelligence.*
- *The future goals of Artificial Intelligence to work with sensors. The inputs are taken from sensors and Artificial Intelligence work accordingly.*
- *The Robotics is also the goal of artificial intelligence. The robots acquire intelligence and perform task smartly.*
- *The Artificial intelligence can build a system which could recognize, interpret, process and simulate human effects. The Quality of interpreting human affect could help in better decision making. So, decision making is the goal of Artificial intelligence. (Source: <https://nareshit.com/goals-of-artificial-intelligence/>)*

10.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define Artificial Intelligence and Machine Learning.
- Explore the Applications of Artificial Intelligence.
- Explore the futuristic trends of Artificial Intelligence and Machine Learning.

- Briefly explain Artificial Intelligence programming languages and popular machine learning methods.

10.3 *ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING- AN OVERVIEW*

Intelligence means the ability to acquire and apply the knowledge. This Knowledge is the information which is acquired through experience and the experience is the knowledge. Knowledge is gained through exposure or training. For all this artificial intelligence is very important. Following are the important terms of Artificial Intelligence:

- Reasoning
- Learning
- Problem Solving
- Perception
- Linguistic Intelligence

There are many tools are available for Artificial Intelligence. These tools can be used for search, mathematical optimization, logic, methods based on probability and economics. The Artificial Intelligence is beneficial in computer science, mathematics, psychology, linguistics, philosophy, neuro-science, artificial psychology and many other areas. The Artificial Intelligence can also use in Natural Language Processing, Gaming, Speech Recognition, Vision Systems, Healthcare, Automotive etc.

The Need of Artificial Intelligence is to create expert systems. Artificial Intelligence based Expert system has the capability to learn, demonstrate, and explain and advice its users. The Artificial Intelligence helps to the systems to find solutions of complex problems. The complex problems are the problem which solved by the humans e.g., complex algorithm.

The Artificial Intelligence is used for the Natural language processing. The Natural language processing gives machines the ability to read and understand human language. Following are different applications of natural language processing:

- Information retrieval,
- Text mining,
- Question answering,
- Machine translation.

The Machine learning is a fundamental concept of Artificial Intelligence. The Machine learning is the study of computer algorithms that improve automatically through experience. There are various tools in Artificial Intelligence. These tools can solve the most difficult problems in computer science, as:

- Search and optimization
- Logic

- Probabilistic methods for uncertain reasoning
- Classifiers and statistical learning methods
- Neural networks
- Control theory
- Languages

The Artificial Intelligence application also includes autonomous vehicles. The drones and self-driving cars are the example of Artificial Intelligence. Following are some more example where Artificial Intelligence is being used massively:

- Medical diagnosis,
- Creating art (e.g., poetry),
- Proving mathematical theorems,
- Playing games (e.g., chess or go),
- Search engines (e.g., google search),
- Virtual assistants (e.g., siri),
- Image recognition in photographs,
- Spam filtering,
- Prediction of judicial decisions and
- Targeted online advertisements.

The Artificial Intelligence can also be used in Healthcare, Automotive, Finance, Video games etc. Due to the Artificial Intelligence following term came in the existence:

- Intelligent machines
- human-machine hybrids
- A superintelligence,
- hyperintelligence,
- Superhuman intelligence.

(Source 1: https://en.wikipedia.org/wiki/Artificial_intelligence; Source 2: <https://www.Geeksforgeeks.org/artificial-intelligence-an-introduction/>)

Artificial Intelligence can be used in many areas. Following diagram shows many areas of Artificial Intelligence:

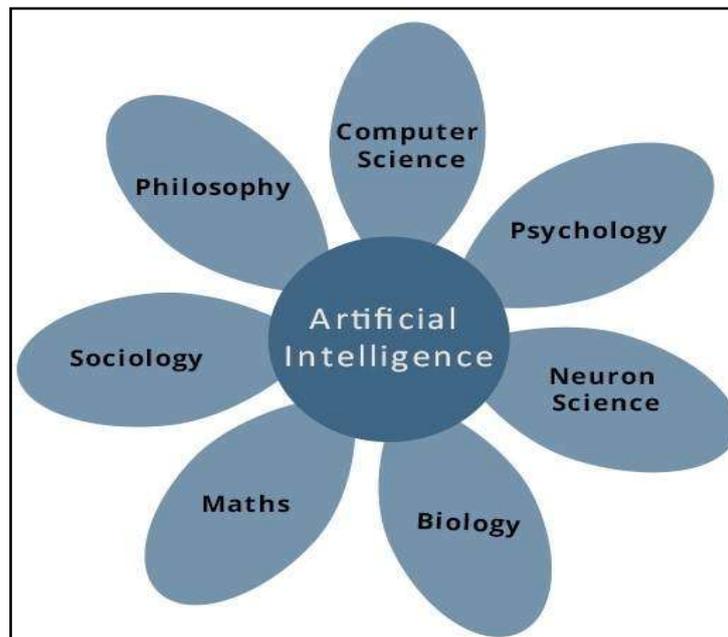


Figure 10.1 Areas of Artificial Intelligence

(Source: https://www.tutorialspoint.com/artificial_intelligence/images/components_of_ai.jpg)

10.4 APPLICATIONS OF ARTIFICIAL INTELLIGENCE

Artificial intelligence can be used many areas and it has many applications:

- **Gaming Application-** Artificial intelligence is very important for developing and designing games such as chess, poker, tic-tac-toe, etc. In Artificial intelligence-based game the machine can think of large number of possible positions which is based on heuristic knowledge.
- **Natural Language Processing Application-** The Artificial intelligence make possible machine to understands natural language spoken by humans.
- **Expert Systems Application-** The Expert Systems can advise and provide explanation to the Humans. It can integrate machine, software, and other special information which impart reasoning and advising.
- **Vision Systems Application-** In the Artificial intelligence, the Vision Systems can understand, interpret, and comprehend visual input on the computer. e.g. (i) The photographs taken by spying aeroplane. These photographs are used to figure out spatial information or map of the particular areas. (ii) The Doctors can use clinical expert system to diagnose the patient with help of visual images. (iii) Face detection is very important. Through recognition the police can detect the face of criminal. They can detect it with the stored portrait which is made by forensic artist.
- **Speech Recognition Application-** These days the Artificial Intelligence is massively using in Speech Recognition. Many systems are efficiently using the speech recognition application they are understanding the sentences and their meanings while a human talk

to it. These systems can handle different accents, slang words, noise in the background, or change in human's noise due to cold, etc.

- **Handwriting Recognition Application-** The Artificial Intelligence can also be used for handwriting recognition. This type of software reads the text written on paper by a pen or on screen by a stylus. This software can recognize the shapes of the letters. They can convert them into editable text.
- **Intelligent Robots Application-** Using Artificial Intelligence Robots are able to perform the tasks given by a user or human. The AI based robots have sensors to detect physical data from the real world. These sensors may be light, heat, temperature, movement, sound, bump, and pressure. The robots have efficient processors, multiple sensors and huge memory, and they also exhibit intelligence. The robots are capable of learning from example and learning from their mistakes. They can also capable to adapt the new environment.

(References: https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_overview.htm)

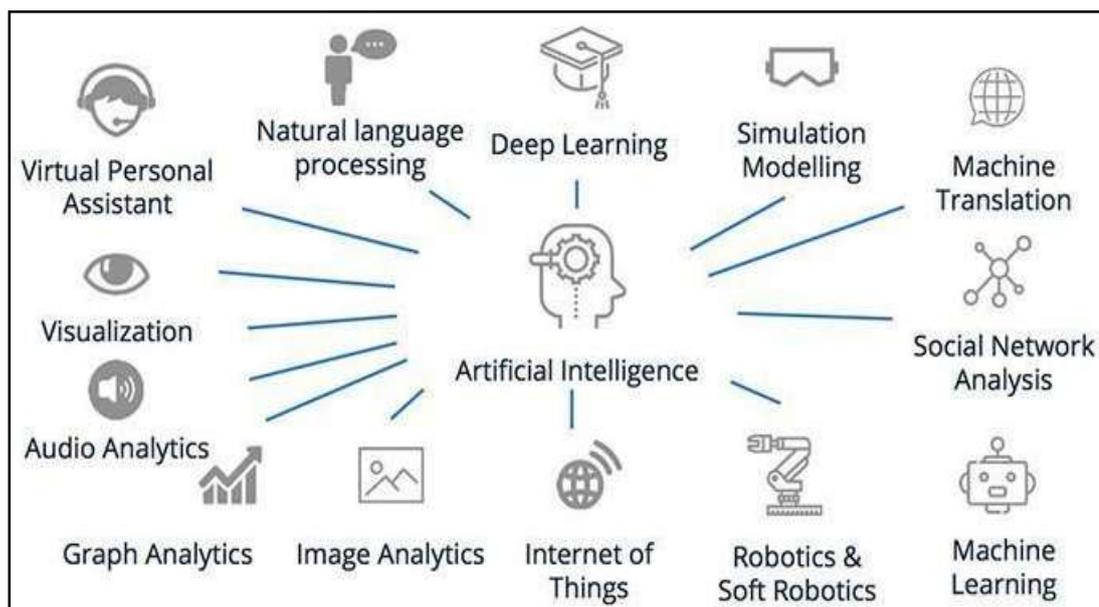


Figure 10.2 Application areas of Artificial Intelligence

(Source: <https://i1.wp.com/www.mauriziopittau.it/wp-content/uploads/2017/12/AI-applications.jpg>)

10.5 ***FUTURE TRENDS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING***

Artificial Intelligence basically used to develop intelligent systems. It can also be used for reading the behaviour of humans. Artificial Intelligence based system learns, decide and work in specific situations. The Artificial Intelligence based system can also learns and observes humans then behave accordingly.

- Artificial Intelligence can Reduce human errors. In future Artificial Intelligence can perform various tasks using intelligent systems with greater efficiency.
- In future Artificial Intelligence perform difficult tasks which are not possible through human like exploring ocean, doing many hard laborious works with ease.
- There are many types of applications has been developed using artificial intelligence. The iPhones Siri, Alexa and Microsoft's cortana etc which are developed using artificial intelligence. These devices will be used frequently in future.

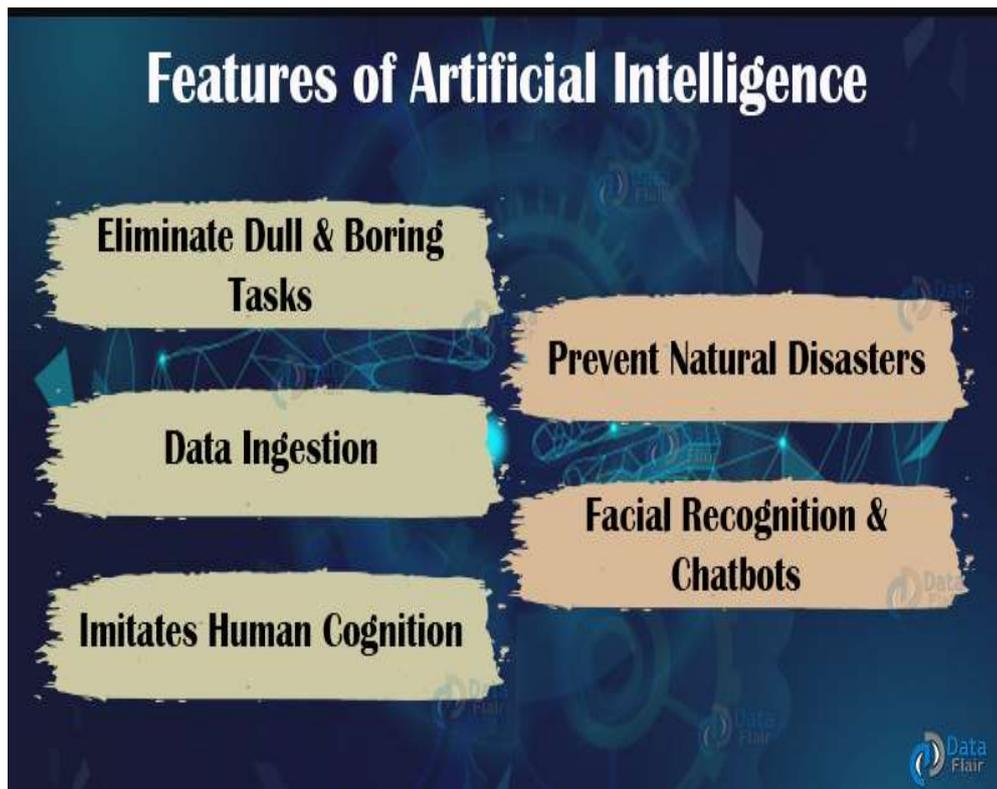


Figure 10.3 Features of Artificial Intelligence

(Source: <https://d2h0cx97tjks2p.cloudfront.net/blogs/wp-content/uploads/sites/2/2019/10/features-of-artificial-intelligence.jpg>)

- The artificial intelligence technology can develop digital assistants. These digital assistants can perform many tasks at amazing efficiency with human being.
- The artificial intelligence can be used for many difficult fields. Like in medical field Radio surgery has been used for tumour treatments which is also developed using artificial intelligence.
- The artificial intelligence can improve productivity, efficiency and accuracy of your system or products.

(References: <https://nareshit.com/goals-of-artificial-intelligence/>)



Figure 10.4 Features of Artificial Intelligence

(Source: <https://dkb46014en6d6.cloudfront.net/tutorials/wp-content/uploads/sites/2/2020/04/features-of-AI.jpg>)

Machine Learning-

Machine Learning is very emerging topic right now. The blockchain and quantum computing is also emerged with the development of new technology. Along with Artificial Intelligence the researcher is creating new Machine Learning models. These models re-train the existing models. Their performance and results are better. You can implement machine learning in Artificial Intelligence. The programming of machine learning is Python programming. (Reference: https://www.tutorialspoint.com/machine_learning/index.htm)

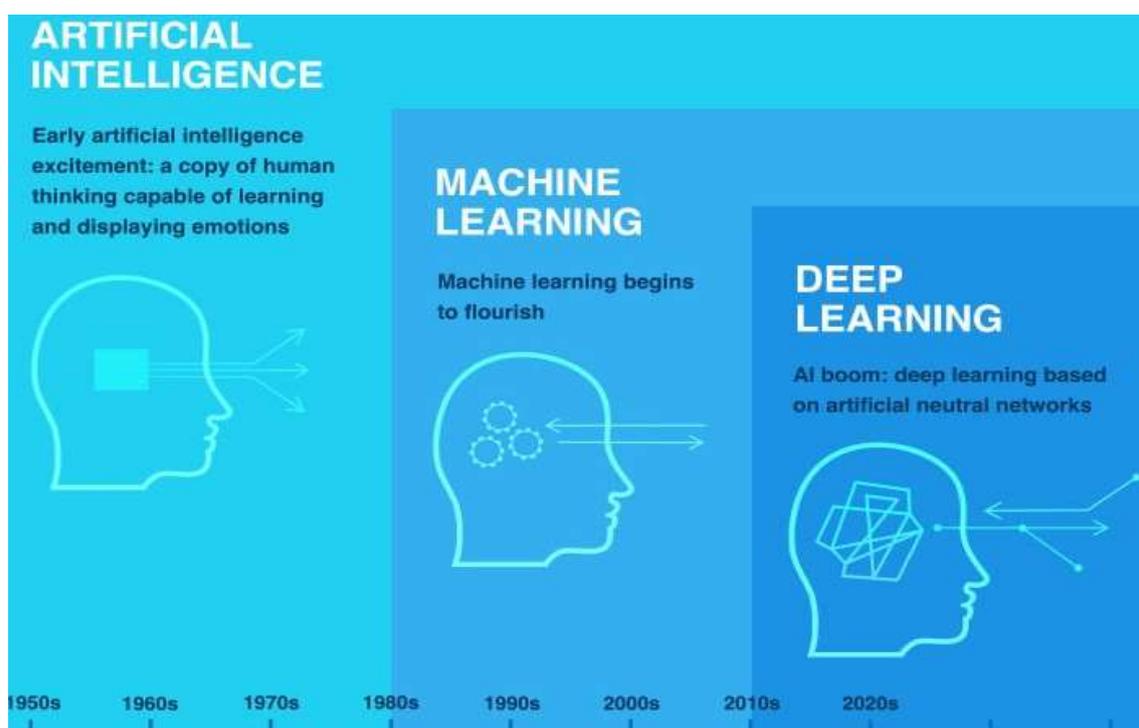


Figure 10.5 Machine Learning

(Source: <https://www.livehome3d.com/assets/img/articles/ai-in-interior-design/ai.jpg>)

During 80's the Machine Learning is flourished. After 2010 Artificial Intelligence is in boom. Deep learning is based on Artificial Neural Network. Recently the Machine learning is an emerging technology along with Artificial Intelligence, and Deep Learning. This technology enables computers to learn by example or learn automatically from past data. Various algorithms develop mathematical models using Machine learning. These are making predictions using historical data. Machine Learning is used for image recognition, speech recognition, email filtering, Facebook auto-tagging, recommender system etc.

The machine learning techniques are Supervised, Unsupervised, and Reinforcement learning. Humans always learn from their experiences with their learning capability, while the computers or machines work on our instructions. If a machine also learns from experiences like human with past data. So, this is Machine Learning. (References: www.javatpoint.com/machine-learning)

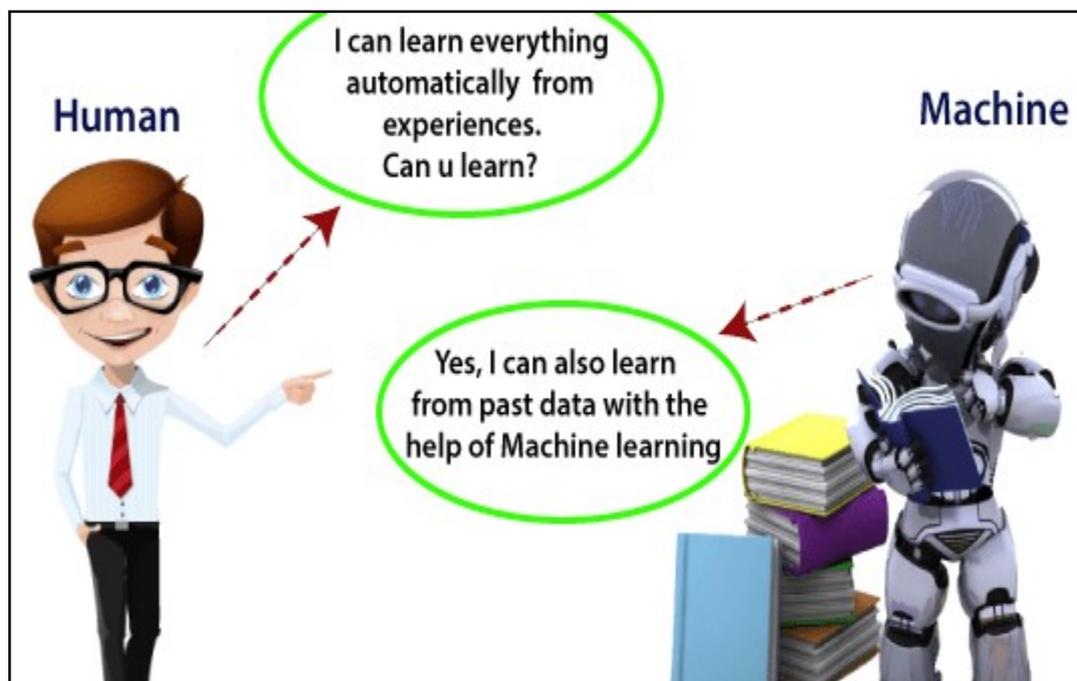


Figure 10.5 Human Learning vs Machine Learning

(Source: <https://static.javatpoint.com/tutorial/machine-learning/images/introduction-to-machine-learning.png>)

Machine Learning is a subset of artificial intelligence. Machine Learning algorithms can be developed. It allows a computer to learn from the experiences and past data. The machine learning was introduced by Arthur Samuel in 1959. The machine learning can be defined as: "Machine learning enables a machine to automatically learn from data, improve performance from experiences, and predict things without being explicitly programmed."

Machine learning uses sample historical data, this data is known as training data. By using this training data machine learning algorithms build a mathematical model. These mathematical models can be used in making predictions or decisions. The Machine learning

brings computer science and statistics together. By combining them you can create predictive models. Machine learning creates the algorithms which learn from historical data or example. The higher learning means the higher performance we will get.

The accuracy of machine learning predicted output is based on the quantity of data for training. So, the large amount of data always helps to build a better and accurate prediction model. (References: www.javatpoint.com/machine-learning) The following diagram describe the working of Machine Learning algorithm:

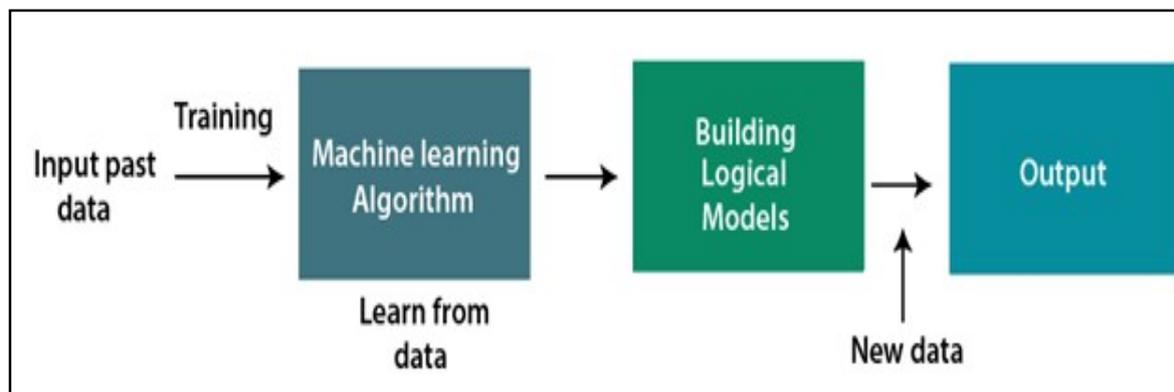


Figure 10.6 Working of Machine Learning Algorithm

(Source: <https://static.javatpoint.com/tutorial/machine-learning/images/introduction-to-machine-learning2.png>)

Following are the major Features of Machine Learning:

- The Machine learning can use data to find various patterns.
- The Machine learning can learn from previous data. It improves its performance automatically.
- The Machine learning is a data-driven technology.
- The Machine learning is very much similar to data mining. Machine Learning deals with the large amount of the data.

(Reference: www.javatpoint.com/machine-learning)

AI in Learning-

Artificial intelligence is just like a human intelligence. It has the ability that a computer system can perform tasks and activities accordingly. The Artificial intelligence technology is revolutionizing education sector and industry. Now the robots are going to be the part your job. They are making your job very easier. They are also very helpful in teaching. Artificial intelligence is also very important in education. (Reference: <https://www.theedadvocate.org/the-effects-of-artificial-intelligence-on-education/>)

10.6 ARTIFICIAL INTELLIGENCE PROGRAMMING LANGUAGES

Artificial intelligence is now one of the most important technology in all area of our live. It is making quick and convenient life for us. As Artificial intelligence is growing so the need for good and professional programmers or developers. There are a lots of programming languages which are used for Artificial Intelligence. There are many commonly used Programming languages in Artificial Intelligence. Following are Top Programming Languages of Artificial Intelligence and Machine Learning:

Python-

Python Language is more likely to C++, C and Java. Python can develop Artificial Intelligence software solutions. Python is a platform-independent programming language for artificial intelligence and Machine Learning. There are Some most important AI libraries are as follows-

- TensorFlow is for artificial intelligence tasks and databases.
- Scikit-learn is for having trained machine learning techniques.
- PyTorch is pattern recognition and machine learning processing.
- Keras is as just a code application for highly huge amounts of data and operational activities.
- SparkMLlib is makes machine learning accessible for anyone with tools including algorithms and appliances.

Java-

Java programming language is also used for Artificial Intelligence. Java Programming Language has been used to create Artificial Intelligence. Java has different Library as:

- TensorFlow Library
- Deep Java is Developed by Amazon. It can deploy Java machine learning capabilities.
- Kubeflow supports quick installation and control of Machine Learning of Kubenet frameworks. It offers ready-to-use Machine Learning applications.

Prolog-

Prolog is a Logic Programming language. It is very good language to improve Artificial Intelligence, and natural language. Prolog functions are best suited for mobile applications.

Lisp-

Lisp is one of the oldest and most suitable languages for Artificial intelligence. This language is very famous for for its high development and testing capability. It is for fast creative development of new models.

Haskell-

This Programming Language strictly functional. It's very secure programming language. Haskell is like other programming languages. It is best for small community of developers.

R Language-

This language is best to process Big data. It is the most powerful languages and frameworks for the processing of large data. For example, poorly-designed publisher-quality graphs, incorporating mathematical formulas etc. It is a multipurpose language. Several packages, of R like RODBC, Models, Class, and Tm, can be used in artificial intelligence and machine learning.

(References: <https://www.trickyenough.com/programming-languages-for-artificial-intelligence-machine-learning/>)

10.7 POPULAR MACHINE LEARNING METHODS

The widely used and popular machine learning methods are supervised learning and unsupervised learning as:

- **Supervised learning algorithms:** In this case an input where the desired output is already known. The Supervised learning algorithms gets a set of inputs along with the corresponding correct outputs data. This algorithm train or learns by comparing its actual output with forecasted outputs to find errors and modifies the model accordingly. This algorithm is mainly used in applications where historical data used to predicts future trends.
- **Unsupervised learning algorithms:** is used with the data that is not historical. Unsupervised learning works well for transactional data.
- **Semi supervised learning algorithms:** It is same as supervised learning but it uses labelled and unlabelled data for training. It uses specially a small quantity of labelled data with a large quantity of unlabelled data. The unlabelled data is less expensive. This type of data takes less effort to acquire. This type of algorithms can be used for classification, regression and prediction. Mainly the Semi supervised learning is beneficial when the cost associated with data e.g., to face detection.
- **Reinforcement learning algorithms:** is used basically for robotics, gaming and navigation. These algorithms are discovered by trial and error. The goal of reinforcement learning is to understand and learn the best policy.

(References: https://www.sas.com/en_us/insights/analytics/machine-learning.html)

How Machine Learning Works?

Following are four basic steps for building a machine learning application or model. These steps are very important for data scientists. The data scientist can work closely with the business professionals. The machine learning model can be developed for businesses.

Step 1: Select and prepare a training data set

Step 2: Choose an algorithm to run on the training data set

Step 3: Training the algorithm to create the model

Step 4: Using and improving the model

NOTE- Artificial intelligence is just like a human intelligence. The Artificial intelligence technology is revolutionizing all sector and industry. The robots are going to be the part your life. They are also very helpful in teaching. Artificial intelligence is now one of the most important technology in all area of our live. It is making quick and convenient life for us. Finally, we can say that Artificial Intelligence is the future technology.

10.8 POINTS TO REMEMBER

- Artificial Intelligence is helpful to develop or design smart machines. It is able to design self-learning software applications. The Artificial Intelligence is helpful for humans, to improves their decision making.
- There are many tools are available for Artificial Intelligence. These tools can be used for search, mathematical optimization, logic, methods based on probability and economics. The Artificial Intelligence can also use in Natural Language Processing, Gaming, Speech Recognition, Vision Systems, Healthcare, Automotive etc.
- The Artificial Intelligence is used for the Natural language processing. The Natural language processing gives machines the ability to read and understand human language.
- Artificial intelligence is a subject like Biology, Psychology, Linguistics, Mathematics, and Engineering. The major functions of artificial intelligence are reasoning, learning, and problem solving.
- Artificial Intelligence based system learns, decide and work in specific situations. The Artificial Intelligence based system can also learns and observes humans then behave accordingly.
- The goal of Artificial intelligence to make knowledge representation easy. It means representing information such a way that machine or computer can understand it.
- The main goal of Artificial intelligence is to develop intelligent machines. So the goal of Artificial Intelligence system is to learn and memorize of data.
- The goal of artificial intelligence is to develop machines which can read and understand human languages.
- The future goals of Artificial Intelligence to work with sensors. The inputs are taken from sensors and Artificial Intelligence work accordingly.
- The Robotics is also the goal of artificial intelligence. The robots acquire intelligence and perform task smartly.
- The Quality of interpreting human affect could help in better decision making. So decision making is the goal of Artificial intelligence.
- Artificial Intelligence can Reduce human errors. In future Artificial Intelligence can perform various tasks using intelligent systems with greater efficiency.

- In future Artificial Intelligence perform difficult tasks which are not possible through human like exploring ocean, doing many hard laborious works with ease.
- There are many types of applications has been developed using artificial intelligence. The iPhones Siri, Alexa and Microsofts cortana etc which are developed using artificial intelligence. These devices will be used frequently in future.

10.9 GLOSSARY

- **Gaming Application-** Artificial intelligence is very important for developing and designing games such as chess, poker, tic-tac-toe, etc. In Artificial intelligence-based game the machine can think of large number of possible positions which is based on heuristic knowledge.
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corresponding correct outputs data. This algorithm train or learns by comparing its actual output with forecasted outputs to find errors and modifies the model accordingly. This algorithm is mainly used in applications where historical data used to predicts future trends.

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- Prolog - Prolog is a Logic Programming language. It is very good language to improve Artificial Intelligence, and natural language. Prolog functions are best suited for mobile applications.
- Lisp - Lisp is one of the oldest and most suitable languages for Artificial intelligence. This language is very famous for its high development and testing capability. It is for fast creative development of new models.
- Haskell - This Programming Language strictly functional. It's very secure programming language. Haskell is like other programming languages. It is best for small community of developers.
- R Language - This language is best to process Big data. It is the most powerful languages and frameworks for the processing of large data. For example, poorly-designed publisher-quality graphs, incorporating mathematical formulas etc. It is a multipurpose language.

10.10 CHECK YOUR PROGRESS

Descriptive Type Questions-

- a) What do you mean by knowledge? How Knowledge is acquired through? How Knowledge is associated with artificial intelligence?
- b) What are the different applications or examples where Artificial Intelligence is being used massively?
- c) What is Vision System? How Artificial intelligence, beneficial in Vision Systems? How will you understand, interpret, and comprehend visual input on the computer?
- d) How Artificial Intelligence can be used for reading the behaviour of humans? Explain how this system learns, decide and work in specific situations.
- e) How Machine learning is an emerging technology along with Artificial Intelligence, and Deep Learning. Explain how Machine learning enables computers to learn by example or learn automatically from past data.

- f) How Machine learning is making predictions using historical data. Which technology is used for image recognition, speech recognition, email filtering, Facebook auto-tagging, recommender system?
- g) How Machine learning can improve its performance automatically?
- h) What are different programming languages which are used for Artificial Intelligence and Machine Learning?
- i) What are the widely used and popular machine learning methods? What is the difference between the supervised learning and unsupervised learning?
- j) What are the basic steps for building a machine learning application or model? How these steps are important for data scientists?

Objective Type Questions-

- a) In Artificial Intelligence the means the ability to learn and solve problems.
- b) The based systems have the ability to think and decision making.
- c) The Machine learning is a fundamental concept of
- d) The Artificial Intelligence application also includes autonomous
- e) The drones and self-driving cars are the example of
- f) Now trying towards that machine can think.
- g) The expert systems always exhibit intelligent behaviour, it can learn, demonstrate, explain, and advice its
- h) Artificial intelligence aims to Implement Human Intelligence in Machines, it can create systems to understand, think, learn, and behave just like
- i) The robots are capable of learning from example and from their mistakes. They can also capable to adapt the new environment.
- j) Artificial intelligence can also be used for reading the behaviour of
- k) The Artificial Intelligence based system can also learns and observes then behave accordingly.
- l) The techniques are Supervised, Unsupervised, and Reinforcement learning.
- m) learning algorithms is used with the data that is not historical.

Answer (Objective Type Questions)-

- | | | | |
|------------------|-----------------------------|-----------------------------|------------|
| [a] Intelligence | [b] Artificial Intelligence | [c] Artificial Intelligence | |
| [d] Vehicle | [e] Artificial Intelligence | [f] Artificial Intelligence | |
| [g] Users | [h] Humans | [i] learning | [j] Humans |
| [k] Humans | [l] Machine learning | [m] Unsupervised | |

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10.13 SUGGESTED READINGS

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- Rich, Elaine Knight, Kevin, Artificial Intelligence, Tata McGraw Hill.

UNIT- 11

AN INTRODUCTION TO CLOUD COMPUTING AND INTERNET OF THINGS (IoT)

- 11.1 INTRODUCTION

- 11.2 OBJECTIVES

- 11.3 CLOUDING COMPUTING- AN OVERVIEW

- 11.4 APPLICATIONS OF CLOUD COMPUTING

- 11.5 TYPES OF CLOUD COMPUTING SERVICES: IAAS, PAAS, AND SAAS

- 11.6 INTERNET OF THINGS (IoT)- AN OVERVIEW

- 11.7 HOW THE INTERNET OF THINGS (IoT) WORKS?

- 11.8 INTERNET OF THINGS (IoT) FRAMEWORK

- 11.9 POINTS TO REMEMBER

- 11.10 GLOSSARY

- 11.11 CHECK YOUR PROGRESS

- 11.12 BIBLIOGRAPHY/ REFERENCES

- 11.13 SUGGESTED READINGS

11.1 INTRODUCTION

The Cloud computing is the on-demand computer resources. These computer resources are basically data storage or cloud storage, software and computing power. The Cloud computing refers data centres. These data centre available to all users in the Internet. The Large clouds, are established by big IT giants. They are distributed on different locations from centralized servers. edge server can also be established for close users. The enterprise clouds may be limited to a single organization however the public clouds are available to many organizations.

The cloud computing help companies to minimize IT infrastructure costs. The cloud computing makes the company to improve their system and it run faster. It improves manageability and less maintenance. The cloud computing enables IT teams to more rapidly adjust resources so

that it can meet fluctuating and unpredictable demand. It can provide high computing power during the peak demand time.

NOTE-

Cloud Computing is a new generation of computing. The following are the objectives which are very important shifting or moving to cloud:

- *To optimize the cloud investment however cloud offers benefits like reduced costs and complexities, better agility. Before moving to cloud we have to identify and decide our security challenges. The availability and integration of system has to be carefully balanced.*
- *To establish Hybrid Cloud Computing. For Hybrid Cloud Computing the application and data integration should be focused.*
- *To develop Cloud-centric design which is necessarily required in every organization. While creating any IT Infrastructure the Cloud models should be under consideration. During migration on cloud, it should be optimized. The system should completely utilize the cloud potential.*
- *Following diagram shows the different audit objective of cloud computing as define strategic IT plan, define the information architecture, define IT processes, communicate management aims and direction, access and manage IT risk, and identify vendor management security controls. These all*



objectives are very important for establishing a cloud-based infrastructure.

Figure 11.1 Cloud Computing Audit Objective

<https://linfordco.com/wp-content/uploads/2017/12/cloud-computing-audit-objectives.jpg?83018c&83018c>

- *The future of data centre is very bright. So ultimately to switch on cloud computing.*
- *To builds private data centres to implement the cloud. They can be cloud service providers. After applying the concept of cloud computing the organization can improve the infrastructure. By increasing the data centres investments, we can increase both efficiency and capability.*
- *To implement cloud in any organization, save money and encourage innovation and experimentation. (Source: <https://www.allerin.com/blog/5-business-objectives-to-consider-while-developing-a-cloud-strategy/>)*

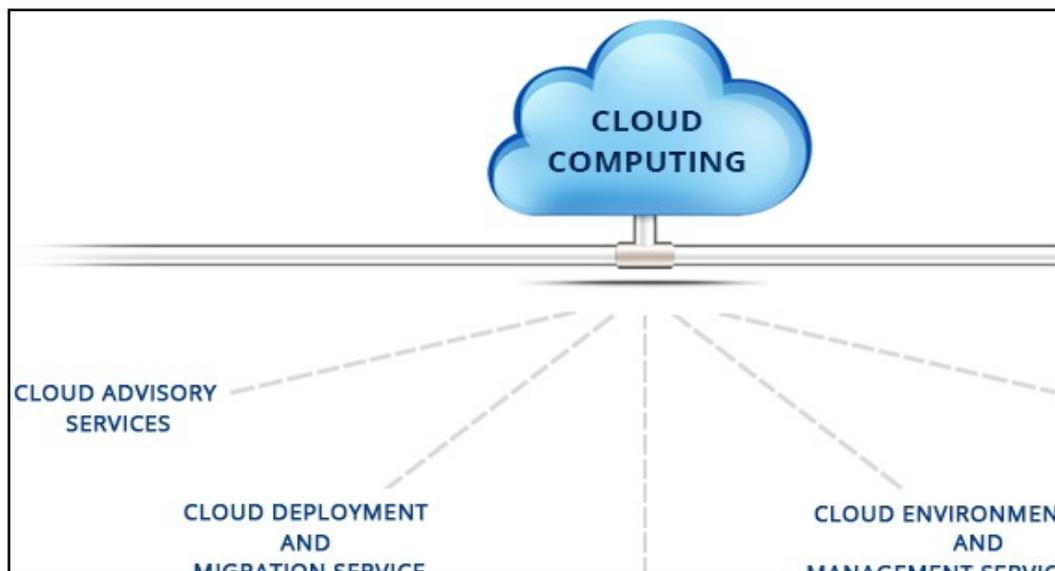


Figure 11.2 Cloud Computing Objectives

(Source: <https://www.ebintl.com/Styles/Images/cloud-computing.png>)

Seeing the importance of the Cloud Computing it has varied objective in addition to the above. Following are some more important objective of cloud computing:

- To establish cloud advisory service.
- Cloud development and migration service.
- Cloud development and assurance service.
- Cloud environment build and management service.
- Disaster recovery cloud service.

11.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

11.3 CLOUDING COMPUTING- AN OVERVIEW

The Cloud Computing is now as "pay-as-you-go" model. It has reduced the operating expenses. The cloud computing is very successful in this recent era because of:

- High-capacity networks.
- Low-cost computers.
- Storage devices.
- Widespread adoption of hardware virtualization.
- Service-oriented architecture.
- autonomic and utility computing.

As per the above fact cloud computing is possible now easily (Source: https://en.wikipedia.org/wiki/Cloud_computing). The Cloud Computing becomes one of the

important topics among today's technology. Google, IBM & Amazon are the example of it. It has evolved the Internet in a new form. Practically, cloud computing requires internet facility, set of web-services etc. (Source: <https://www.w3schools.in/cloud-computing/cloud-computing/>)

The small business, small IT companies, basically follow old traditions of managing IT infrastructure. They establish their own server room, which store all the details. They always maintain their own server. The advance companies are using and sharing cloud infrastructure rather than establishing own IT infrastructure. They always share server, database servers, mail server, firewalls, routers, switches, Load handler, and other networking devices from cloud. By doing this they save huge amount of investment in IT infrastructure. Therefore, to reduce the IT infrastructure cost, the Cloud Computing technology came into existence. Source: <https://www.w3schools.in/cloud-computing/cloud-computing/>)



Figure 11.3 Cloud Computing

(Source: <https://timesofcloud.com/wp-content/uploads/2016/11/Screen-Shot-2016-11-26-at-4.11.03-pm.png>)

In the above diagram you can see that Smartphone, Laptop, Server, Network, Mobile, Tablet Computer, and Databases are connected with cloud. All these resources are now very powerful due to the cloud backbone. These resources don't have more processing power, more memory but still they are very powerful due to the cloud (Source: <https://www.w3schools.in/cloud-computing/cloud-computing/>). Following diagram shows the element of the cloud:



Figure 11.4 Element of the Cloud

(Source: <https://www.liveblogspot.com/wp-content/uploads/2017/12/cloud-computing.png>)

As per above diagram cloud computing is collocation and collaboration of Computer Infrastructure, Distributed Servers, Virtual Desktop, Applications, Remote Services, Databases, Web/Application Hosting. Cloud computing is the new generation technology. It has extensive IT infrastructure. It provides us a way through which we can use and utilize the applications as utilities via the Internet. Cloud computing makes IT infrastructure. This IT Infrastructure is available on demand basis. The cloud includes:

- A development platform,
- Hard disk,
- Computing power,
- Software application,
- Database.

To establish a cloud huge-scale capital expenditure is required. Basically, cloud is a 'pay-per-use,'. The client or customer pay only the amount as they will use from the cloud infrastructure. Following are the major effects of Cloud on Human Lives:

- Using the cloud technology, the application became very cheaper, easier to find, and to use.
- The new generation applications are better to develop & create.
- The social network is very powerful now. Cloud is providing now new social services through connecting social networks.
- Through internet any time cloud can be connected.

(Source: <https://www.w3schools.in/cloud-computing/cloud-computing/>)

11.4 APPLICATIONS OF CLOUD COMPUTING

Cloud computing has been started approximately two decade ago. As per the study of International Data Group, 69% of companies are already using cloud technology. Another

18% are planning to adapt cloud-computing. As per the reports of Dell the businesses are now investing on big data, cloud, mobility, and security. These companies are getting 53% more revenue. This data showing that day by day the companies are using more and more technology. These companies are getting more and more benefits of the cloud-computing. They are using this cloud technology with more efficiency in their companies. They are serving their customers in a better way. Dramatically they are increasing their overall profit shares. (Source: <https://www.salesforce.com/products/platform/best-practices/benefits-of-cloud-computing/>)

Following are some major benefits of cloud computing:

- **Low Cost:** The use of cloud reduces the cost. For execution of cloud technology, we don't require high speed computers & technology. The application runs on the cloud and, on our desktop or device.
- **Storage capacity:** The Storage capacity of Cloud is unlimited. Normally it offers a vast storage capacity of more than 2000-3000 GBs as per the client requirement.
- **Reduced cost of IT infrastructure:** For the organization the investment on cloud technology is always be less. In absence of IT engineer or server engineers the system can run smoothly.
- **Improve computing power:** The capacity of Cloud servers is very high. The speed of running and processing tasks is very high in cloud server.
- **Decrease Software Costs:** Cloud technology minimizes the software costs. Many software and applications are freely available on cloud you don't need to purchase them.
- **Updated software:** While using the cloud technology we always have regular software updates. The obsolete software's are become outdate and high-upgrade software are ready to install.

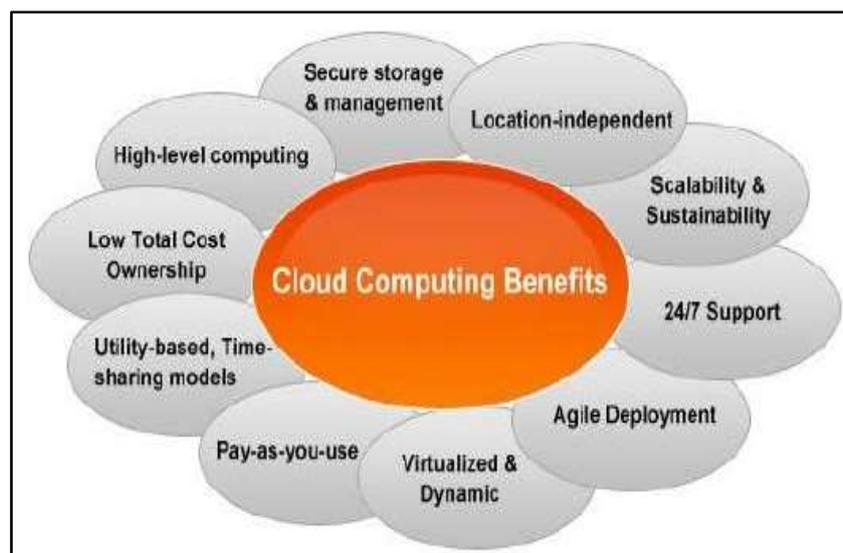


Figure 11.5 Major Benefits of Cloud Computing

(Source: <https://image.slidesharecdn.com/cloudcomputinganoverview-111017224639-phpp02/95/cloud-computing-an-overview-18-728.jpg?cb=1318891648>)

There are many other important benefits of cloud computing as:

(i) Secure storage and management; (ii) Low-cost Ownership; (iii) Utility-based and time-sharing model; (iv) Pay as per use; (v) Virtualized and dynamic; (vi) Scalability and Sustainability; (vii) Location Independent (viii) High Level Computing; (ix) Security and Flexibility; (x) Quality Control and disaster recovery; (xi) Automatic Software Updates; (xii) Competitive Edge and sustainability.

11.5 TYPES OF CLOUD COMPUTING SERVICES: IAAS, PAAS, AND SAAS

The Cloud computing is rising massively. The popularity of cloud computing in recent time is very fast. It reduces on-premise infrastructure cost. It really improves efficiency. Basically, the cloud model has been divided into three major service categories:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

Infrastructure as a Service (IaaS)-

Infrastructure as a Service often provides the infrastructure for example servers, virtual machines, operating system, storage, and networks. It is available on a pay-as-you-use basis. Infrastructure as a Service (IaaS) providers offer virtual machines (VM) from small to extra-large machines (Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>). A cloud vendor provides the following Infrastructure as a Service (IaaS) services: (i) Google Cloud Platform; (ii) Amazon Web Services; (iii) IBM; (iv) HP Public Cloud.

Following diagram shows the Infrastructure as a Service (IaaS) model where Virtual Server and Physical servers are connected and interfaced with cloud consumer. You can see the Infrastructure as a Service (IaaS) service specification in the figure below:

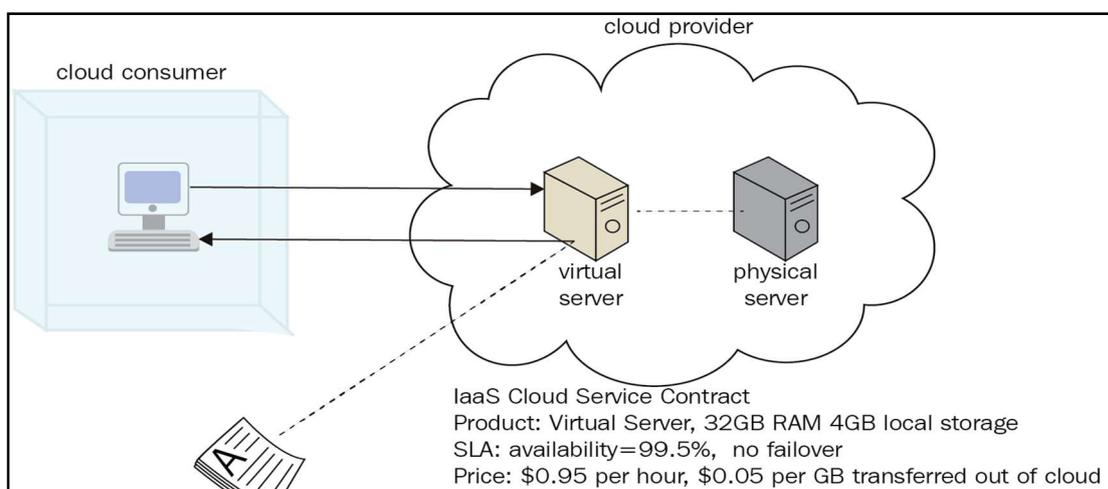


Figure 11.6 Infrastructure as a Service (IaaS)

(Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>)

Platform as a Service (PaaS)-

The Platform as a Service (PaaS) model is similar to Infrastructure as a Service (IaaS) model. The Platform as a Service (PaaS) model provides the additional tools e.g., database management system, business intelligence services, etc. (Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>). Cloud platforms provides following Platform as a Service (PaaS) services:

- SAP Cloud
- Windows Azure
- AWS Lambda
- Google App Engine
- Cloud Foundry
- Amazon Web Services
- Append a Cloud Platform
- IBM Cloud Foundry

(Source: <https://www.webhostingsecretrevealed.net/blog/web-business-ideas/paas-examples/>)

In the following figure the cloud consumer is connected with virtual server having application server, DBMS platforms etc. Platform as a Service is somehow a ready-made environment. We can just use the ready-made platform or application on payment basis. The following figure represents the architecture of the Platform as a Service (PaaS) model.

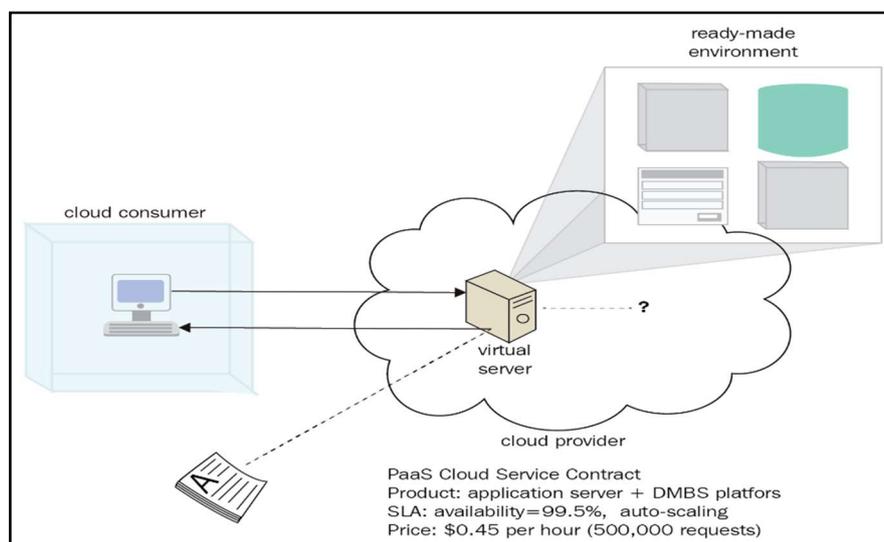


Figure 11.7 Platform as a Service (PaaS)

(Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>)

Software as a Service (SaaS)-

Software as a Service (SaaS) helps to the users to connect to the products, software using the internet. Users can build in-house as a private cloud solution. You can use private cloud on a

subscription basis model (Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>). Following are some cloud vendors who are providing Software as a Service (SaaS):

- Google Application
- Salesforce
- Zoho
- Microsoft Office 365

Following image represents the basic architecture of SaaS model.

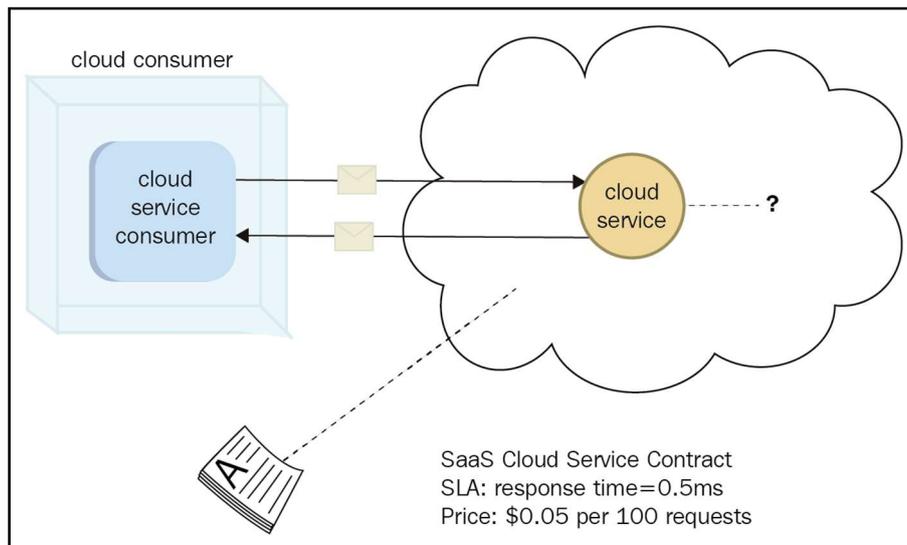


Figure 11.8 Basic architecture of SaaS model

(Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>)

Differences between SaaS, PaaS, and IaaS-

SaaS, PaaS, and IaaS are three major cloud service categories. The difference between SaaS, PaaS, and IaaS models is as follows:

Software as a Service (SaaS)	Platform as a Service (PaaS)	Infrastructure as a Service (IaaS)
<p>In Software as a service (SaaS) model the third-party provider hosts multiple applications. It lets customers to use them on the internet as per use.</p> <p>SaaS is a pay-as-you-use model.</p> <p>Examples: Google Application, Salesforce, Zoho, Microsoft Office 365, Salesforce, NetSuite</p>	<p>In Platform as a service (PaaS) model we have third-party provider application development platform. In PaaS services built on their own infrastructure. These tools are made available to customers on the internet as per use.</p> <p>Examples: Google App Engine, AWS Lambda., SAP Cloud</p>	<p>In Infrastructure as a service (IaaS) model, a third-party application provider. It has servers, storage, compute resources, etc. IaaS provides services for customers for their utilization. By using IaaS they can build their own PaaS and SaaS service for further their customers.</p> <p>Examples: Google Cloud Compute, Amazon S3</p>

(Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>)

We can differentiate the PaaS, IaaS, and SaaS on service level. In the following diagram the OPS means operations. It represents the bare minimum requirement for any specific server. We should consider the following features as per the diagram, before buying and hiring any cloud server. This is having Application, Data, Runtime, Framework, Operating System, Server, Disk, and Network Stack.

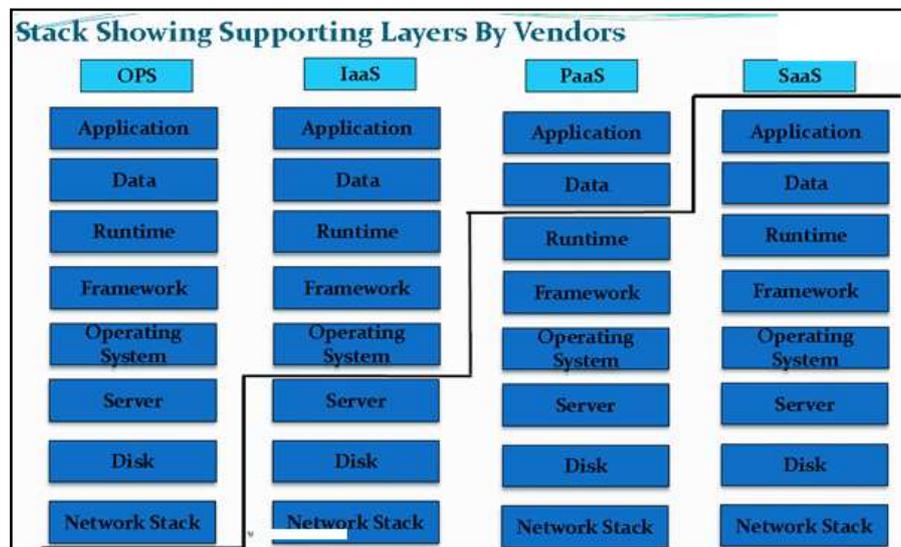


Figure 11.9 Stack showing Supporting layer by vender

(Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>)

While using IaaS we are not bothered about the server, disk, and network stack etc. We don't have to handle hardware part. Therefore, it is called Infrastructure as a Service. While using PaaS, we are not bothered about runtime, framework, and operating system along with the different components in IaaS. Here we focus on application and data. (Source: <https://hub.packtpub.com/cloud-computing-services-iaas-paas-saas/>, book 'Cloud Analytics with Google Cloud Platform' and from Google Cloud Platform.)

11.6 INTERNET OF THING- AN OVERVIEW

Internet of Things (IoT) is a collection of network-enabled devices. It is not like traditional computers, laptops and servers. Internet of Things (IoT) enabled devices has network connections like Wi-Fi connections, Bluetooth connections, and near-field communication (NFC) etc. It includes devices like "smart" appliances, for example: Refrigerators, Thermostats, Home security systems, Computer peripherals such as webcams and printers, Wearable technology (such as- Apple Watches and Fitbits), Routers, Smart speaker devices, like Amazon Echo and Google Home. (Source: <https://www.investopedia.com/terms/i/internet-things.asp>)

The Internet of Things (IoT) is able to connect any device. The IoT is a huge network of connected things and people. IoT devices may be of different shapes and sizes they may be like:

- (i) smart microwaves: It automatically cooks your food within certain time frame.
- (ii) self-driving cars: Its complex sensors detect objects in their root.
- (iii) Wearable fitness devices: which measure your heart rate and the number of steps taken in a day, it uses this information to suggest you exercise plans. (Source: <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>)

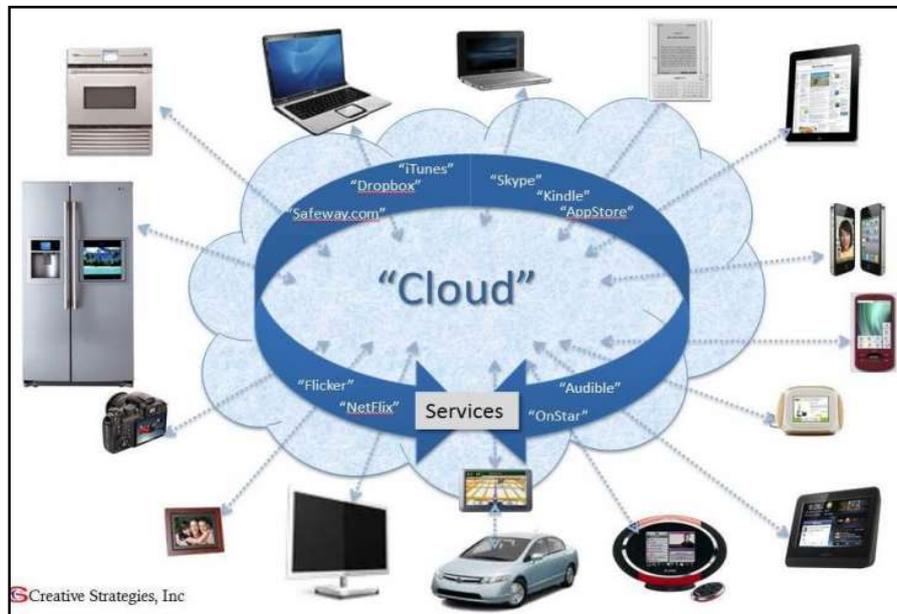


Figure 11.10 Internet of Thing (IoT)

(Source: <https://ismguide.com/wp-content/uploads/2017/10/Internet-of-Things-770x562.png>).

In the above diagram different devices are connected with cloud. The internet is a medium of connection. Collectively it is known as IoT. The internet of things, or IoT, is a group of interrelated computing devices. In IoT the mechanical machines, digital machines, objects, animals or people are given unique identifiers (UIDs). Using these unique identifiers (UIDs) they can transfer data over a network. During this process they never requires human-to-human or human-to-computer interaction.

There are some more example of internet of things like a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile having built-in sensors to inform or alert the driver when tire pressure is low , any physical object which assigned an Internet Protocol (IP) address and which is able to transfer data or information on a network.

The different industries are using IoT. By using IoT we can handle the things more efficiently. We can better understand customers to deliver enhanced customer service, and improve decision-making and increase the value of the business by using IoT. (Source: <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>)

11.7 HOW THE INTERNET OF THINGS (IoT) WORKS?

The Internet of Things (IoT) enabled devices use Internet protocol (IP). The same protocol recognises computers over the world wide web (WWW). It allows devices to communicate with each another. The Internet of things devices automatically report in real-time, improves efficiency and brings important information very quickly (Source: <https://www.investopedia.com/terms/i/internet-things.asp>).

Different Devices and objects with inbuilt sensors are connected to an Internet of Things. The IoT platform integrates data and information from the different devices. After collecting data, the analytics applied to get required information. Further the analytics in powerful IoT platforms can filter the useful information. We can detect patterns and accordingly make recommendations by using Artificial Intelligence on it (Source: <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>).

An IoT ecosystem consists of web-enabled smart devices. It is embedded systems. It has processors, sensors and communication hardware. These IoT devices can collect, send and act on data they receive from their environments. All IoT enabled devices share the sensor data they collect by connecting to an IoT gateway. In these IoT gateway's data is sent to the cloud for analyzing. The data can be analyzed locally. The IoT devices communicate with other IoT devices. These IoT devices works without human intervention. However, people can interact with the IoT devices. The connectivity, networking and communication protocols used with these web-enabled IoT devices largely depend on the specific IoT applications deployed. Artificial intelligence (AI) and machine learning is helpful in making data collection processes in IoT. It makes process easier and more dynamic (Source: <https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>).

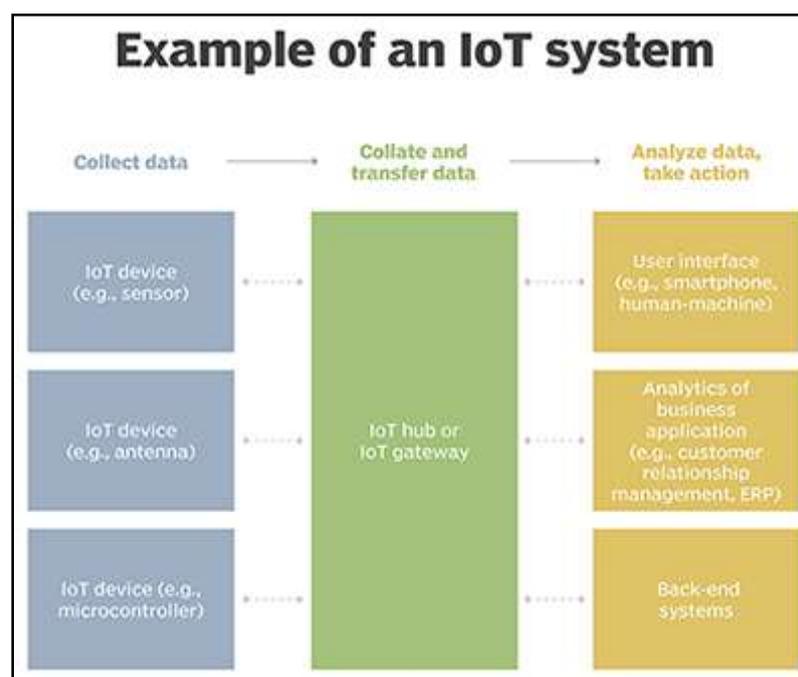


Figure 11.11 Internet of Thing (IoT) System.

(Source: https://cdn.ttgtmedia.com/rms/onlineimages/iota-iot_system_desktop.png)

11.8 INTERNET OF THING FRAMEWORK

IoT (Internet of Things) is a network of devices. This network of devices connected to the internet. These devices transfer and sense the data with very little human intervention. The framework used for this is called the IoT framework. Some common IoT frameworks which are used very frequently are:

KAA IoT.

Cisco IoT Cloud Connect.

ZETTA IoT.

SAP IoT.

IBM Watson.

Hewlett Packard Enterprise, etc. (Source: <https://www.educba.com/iot-framework/>).

Benefits of Internet of Things (IoT) In Different Areas-

The internet of things provides many benefits to any company. Many advantages are industry-specific. Some of them are applicable across multiple industries. Following are the major benefits of IoT in any organization:

- Monitor their overall company processes.
- Improve the customer experience.
- Save time and money.
- Enhance employee productivity.
- Integrate and adapt company models.
- Make better company decisions.
- Generate more revenue
- IoT motivates companies to rethink the methods they approach their companies and gives them the tools to improve their companies' strategies
- IoT has the ability to access information from anywhere at any time and from any device
- Improves communication between connected electronic devices
- Transfer's data packets over a connected network by saving time and money
- Automat's task and helps to improve the quality of a business services and
- Reduces human intervention.

(Source: <https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>)

The IoT is most useful in manufacturing, transportation and utility organizations. It has sensors and other IoT devices. On the other hand, it is very useful for the agriculture, infrastructure and home automation industries, and the organizations moving toward digital transformation. IoT benefits farmers in agriculture. It helps by making their job easier. The IoT Sensors can collect data of rainfall, humidity, temperature and soil content, etc. which help to automate agriculture farming methods. In Infrastructure sector the sensors, can monitor events or

changes in structural buildings, and bridges. With help of IoT and sensors we can be benefited by cost saving, saved time, quality-of-life workflow changes and paperless workflow.

In home automation IoT monitor and manipulate mechanical and electrical systems in a building. In smart cities IoT help citizens to reduce waste and energy consumption. This way IoT touches every area like industry, healthcare, finance, retail and manufacturing etc. (Source: <https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT>).

***NOTE-** Cloud computing is the new generation technology. It has extensive IT infrastructure. It provides us a way through which we can use and utilize the applications as utilities via the Internet. Software as a service (SaaS), Platform as a service (PaaS), Infrastructure as a service (IaaS) are three major services of Cloud. Without Cloud any new technology is not possible. On the other hand, the internet of things, or IoT, is a group of interrelated computing devices. In IoT the mechanical machines, digital machines, objects, animals or people are given unique identifiers (UIDs). Using these unique identifiers (UIDs) they can transfer data over a network. So finally, we can say that these technologies are the future technology so we should be skilled on such technology.*

11.9 POINTS TO REMEMBER

- The Cloud computing is the on-demand computer resources. These computer resources are basically for data storage or cloud storage, software and computing power. The Large clouds, are established by big IT giants. They are distributed on different locations from centralized servers.
- The cloud computing help companies to minimize IT infrastructure costs. The cloud computing makes the company to improve their system and it run faster. It improves manageability and less maintenance. The cloud computing enables IT teams to more rapidly adjust resources so that it can meet fluctuating and unpredictable demand. It can provide high computing power during the peak demand time.
- To builds private data centres to implement the cloud. They can be cloud service providers. After applying the concept of cloud computing the organization can improve the infrastructure. By increasing the data centres investments, we can increase both efficiency and capability.
- Cloud computing is the new generation technology. It has extensive IT infrastructure. It provides us a way through which we can use and utilize the applications as utilities via the Internet. Cloud computing makes IT infrastructure. This IT Infrastructure is available on demand basis.
- Using the cloud technology, the application became very cheaper, easier to find, and to use. The social Network is very powerful now. Cloud is providing now new social services through connecting social networks.

- Cloud computing has been started approximately two decade ago. Data showing that day by day the companies are using more and more cloud technology and getting more and more benefits of the cloud-computing. They are using this cloud technology with more efficiency, serving their customers in a better way and dramatically increasing their overall profit shares.
- The Storage capacity of Cloud is unlimited. Normally it offers a vast storage capacity of more than 2000-3000 GBs as per the client requirement. For the organization the investment on cloud technology is always be less. In absence of IT engineer or server engineers the system can run smoothly.
- The processing capacity of Cloud servers is very high. The speed of running and processing tasks is very high in cloud server. Cloud technology minimizes the software costs. Many software and applications are freely available on cloud you don't need to purchase them.
- In Software as a service (SaaS) model the third-party provider hosts multiple applications. It lets customers to use them on the internet as per use.
- In Platform as a service (PaaS) model we have third-party provider application development platform. In PaaS services built on their own infrastructure. These tools are made available to customers on the internet as per use.
- Infrastructure as a service (IaaS) model, is a third-party application provider. It has servers, storage, compute resources, etc. IaaS provides services for customers for their utilization. By using IaaS they can build their own PaaS and SaaS service for further their customers.
- By using IoT we can handle the things more efficiently. We can better understand customers to deliver enhanced customer service, and improve decision-making and increase the value of the business by using IoT.

11.10 GLOSSARY

- Infrastructure as a Service (IaaS)- Infrastructure as a Service often provides the infrastructure, for example servers, virtual machines, operating system, storage, and networks. It is available on a pay-as-you-use basis. Infrastructure as a Service (IaaS) providers offer virtual machines (VM) from small to extra-large machines.
- Platform as a Service (PaaS)- The Platform as a Service (PaaS) model is similar to Infrastructure as a Service (IaaS) model. The Platform as a Service (PaaS) model provides the additional tools e.g., database management system, business intelligence services, etc.
- PaaS services - Cloud platforms provide Platform as a Services like Windows Azure, Google App Engine, Cloud Foundry, Amazon Web Services.

- Software as a Service (SaaS)- Software as a Service (SaaS) helps to the users to connect to the products, software using the internet. Users can build in-house as a private cloud solution. You can use private cloud on a subscription basis model.
- SaaS Services - Cloud provides Software as a Services like Google Application, Salesforce, Zoho, Microsoft Office 365
- Internet of Things (IoT)- is a collection of network-enabled devices. It is not like traditional computers, laptops and servers. Internet of Things (IoT) enabled devices has network connections like Wi-Fi connections, Bluetooth connections, and near-field communication (NFC) etc.
- Internet of Things (IoT) smart appliances- refrigerators, thermostats, home security Systems, computer peripherals such as webcams and printers, wearable technology, such as Apple Watches and Fitbits, routers, smart speaker devices, like Amazon Echo and Google Home.
- smart microwaves- it automatically cooks your food within certain time frame
- wearable fitness devices- which measure your heart rate and the number of steps taken in a day, it uses this information to suggest you exercise plans.

11.11 CHECK YOUR PROGRESS

Descriptive Type Questions-

- a) How Cloud computing refers data centres? What is the difference between public cloud and private cloud? Explain.
- b) How to establish a cloud Infrastructure? Explain how it require huge-scale capital expenditure?
- c) How the social Network is very powerful now? How cloud is providing now new social services through connecting social networks.
- d) How the client or customer pay only the amount as they will use from the cloud infrastructure? Explain.
- e) How the cloud technology always has regular software updates?
- f) How the cloud technology reduces the cost of software?
- g) What is the Differences between Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)?
- h) Why Internet of Things (IoT) enabled devices use Internet protocol (IP)? How this protocol recognises computers over the world wide web (WWW)?
- i) Can Internet of Things IoT platform integrates data and information from the different devices?
- j) Explain how Internet of Things (IoT) enabled devices share the sensor data collected by connecting to an IoT gateway?

Objective Type Questions-

- a) The enterprise clouds may be limited to a single organization however the clouds are available to many organizations.
- b) Cloud computing makes IT infrastructure and this IT Infrastructure is available on basis.
- c) Using the technology the application became very cheaper, easier to find, and to use.
- d) Through any time cloud can be connected.
- e) To implement cloud in any save money and encourage innovation and experimentation
- f) technology is a 'pay-per-use'.
- g) Through any time cloud can be connected.
- h) The Cloud computing is on-premise infrastructure cost.
- i) The cloud model has been divided into major service categories.
- j) Google Application, Salesforce, Zoho, Microsoft Office 365, Salesforce, NetSuite are the example of
- k) Google App Engine, AWS Lambda, SAP Cloud are the example of
- l) Google Cloud Compute, Amazon S3 are the example of
- m) In has its complex sensors, to detect objects in their root.
- n) The IoT is a huge network of connected and people.
- o) The Internet of things automatically report in real-time, improves efficiency and brings important information very quickly.

Answer (Objective Type Question)-

- | | | | |
|--|----------------------------------|----------------------------------|--------------|
| [a] Public | [b] Demand | [c] Cloud | [d] Internet |
| [e] Organization | [f] Cloud | [g] Internet | [h] Reduces |
| [i] Three | [j] Software as a service (SaaS) | [k] Platform as a service (PaaS) | |
| [l] Infrastructure as a service (IaaS) | [m] Self-driving cars | [n] Things | [o] Devices |

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UNIT- 12

INTRODUCTION TO GPS AND RECENT TRENDS IN ICT

- 12.1 INTRODUCTION

- 12.2 OBJECTIVES

- 12.3 IMPORTANCE AND APPLICATIONS OF GPS

- 12.4 HARDWARE REQUIREMENT FOR GPS

- 12.5 SOFTWARE REQUIREMENT FOR GPS

- 12.6 IMPLEMENTATION OF GPS TOOLS

- 12.7 RECENT TRENDS IN ICT AND GPS

- 12.8 POINTS TO REMEMBER

- 12.9 GLOSSARY

- 12.10 CHECK YOUR PROGRESS

- 12.11 BIBLIOGRAPHY/ REFERENCES

- 12.12 SUGGESTED READINGS

12.1 INTRODUCTION

Basically, the Global Positioning System (GPS) is a satellite-based navigation system. It was initially developed for the military applications. From the year 1980, the Global Positioning System (GPS) is available for civilian use also. Now Global Positioning System (GPS) is used for many purposes. GPS is maintained by the United States government and is freely accessible by anyone with a GPS receiver. It is used knowing the weather conditions. It can give the weather condition anywhere in the world, 24 hours a day, 365 days a year. Many satellites are making up the GPS space segment. They are orbiting our earth about 12,000 miles above us. These satellites of Global Positioning System (GPS) are travelling at speeds of roughly 7,000 miles an hour. These satellites are mainly powered by solar energy. However, they have backup batteries onboard to keep them running in the event of a solar eclipse, when there's no solar

power. A Small rocket booster on each satellite always keeps them flying. It guides them in their predefined and correct path and each satellite weighs roughly about 2,000 pounds.

Global Positioning System (GPS) functioning:

Global Positioning System (GPS) satellites circle the whole earth twice a day. It transmits signal information to earth. GPS calculate the user's exact location. The GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. This difference of time means how far the GPS receiver is from the satellite. So, with distance measurements from a few more satellites, the receiver can determine the user's position. The user's position displays on his electronic map. Generally, a Global Positioning System (GPS) satellites receiver must be locked on to the signal of at least three satellites to calculate a 2D position and track movement. The 2D position means latitude and longitude. In view with four more satellites, the receiver can determine the user's 3D position. The 3D position means latitude, longitude and altitude. After calculating the position of user, the GPS unit can calculate other information. Other information is like speed, bearing, track, trip distance, distance to destination, sunrise and sunset time etc. ([https://www.equipcoservices.com /support/tutorials/introduction-to-global-positioning-systems/](https://www.equipcoservices.com/support/tutorials/introduction-to-global-positioning-systems/))

12.2 OBJECTIVES

After the successful completion of this unit, you will be able to-

- Define the importance of GPS.
- Explore the applications of GPS.
- Explore the recent trends in ICT and hardware software requirement for connecting with GPS.

12.3 IMPORTANCE AND APPLICATIONS OF GPS

Global Positioning System (GPS) is very important. It is used for many purposes. Now Drivers uses GPS navigating streets. The pedestrians use GPS on mobile devices to navigate walking paths. The GPS devices are being used to monitor human and animal movement. The GPS is very helpful to track locations. The estimate is that there are billions of dollars in annual sales of GPS equipment to civilian users. The military sales are also very high. The time accuracy expected with GPS is under 1 microsecond.

Since 1980s the GPS is freely available to all. It is free to companies, countries, organizations and to anyone. GPS is used by Airlines, trucking companies, shipping companies, and on car to monitor the location. The GPS track the location of flights, trucks, vessels, and cars. The GPS navigation route can be monitored in the shortest possible time. The navigation route is calculated very accurately as possible. (Source: <https://hikinggpszone.com/why-is-gps-important/>)

GPS helps you to find your position your traveling place. Navigation and positioning are important. It is very difficult also but these activities become easier through GPS. Once GPS locates your position, and then it starts tracing your speed, bearing, tracks, trip distance, sunrise/sunset time, distance to destination etc. GPS satellite is just like 'man-made' stars. It is reference points to calculate positions accurate. Recently the GPS is very much efficient, you can measure centimetre readings very accurately. GPS is so efficient that you can give a unique and specified address to every square meter on the planet. GPS is used into cars, planes, boats, construction equipment's, smartphones, laptop computers and shoes (www.gpsshoe.com) and belts also. The GPS is installed in the phone it can help us to get automated GPS information through our cell phones (Source: <https://www.etimes.com/how-does-a-gps-tracking-system-work/>).

Benefits of GPS Tracking Devices

Following are the importance of GPS. The tracking devices can bring a number of benefits? It is useful for fleet management operations. Many of the benefits are related to the efficiency. It reduces cost and improve profitability. Five benefits of GPS tracking devices for fleet management include:

[1] GPS tracking devices helpful in route optimisation

If GPS trackers installed in your fleet vehicles. You will have real-time data of the location of your vehicle. GPS helps to you for ideal route for your vehicle. The ideal route avoids delays due to construction, traffic jams or accidents.

[2] Reduce response times for improved customer service

By Installing the tracking devices in your vehicles will increase response times in dealing with customers by allowing you to select the vehicle closest to the customer location to provide prompt, responsive service.



Figure 12.1 Online map shows the current live location of the fleet vehicles

Source: <https://www.fleetminder.com.au/gps-vehicle-tracking-devices/benefits-gps-tracking-devices-fleet-management/>

[3] To Reduce fuel cost of Vehicle

Now the fuel costs are one of the biggest expenses. Using GPS devices, we can reduce these costs. This way we can save our valuable money. The GPS tracking devices allow you to reduce the idle time of your fleet vehicles spend sitting in traffic. It provides the most efficient route on the road for your fleet drivers.

Printed For :		Printed On :	
Vehicle : X[REDACTED]		Driver Name : Vic Odyssey	
Idle Start	Idle End	Duration(min.)	Location

Figure 12.2 Typical idle report by driver using GPS

Source: <https://www.fleetminder.com.au/gps-vehicle-tracking-devices/benefits-gps-tracking-devices-fleet-management/>

[4] Improve safety for fleet vehicles

The GPS is helpful in overall safety of your entire fleet. We can track GPS devices and identify any problem with your driver. You can also catch an expensive repair bill due to poor driving habits, with help of GPS. As drivers know that their driving habits are being monitored, they will not take unnecessary risks. Ultimately this exercise will reduce wear and tear on your vehicles.

Printed For :			
Vehicle :			
Event Type	Event Date	Speed	Location
	Date and time will display here	118.00	Road location data wi
	Date and time will display here	118.00	Road location data wi
	Date and time will display here	118.00	Road location data wi

Figure 12.3 Typical over speed report by driver

Source: <https://www.fleetminder.com.au/gps-vehicle-tracking-devices/benefits-gps-tracking-devices-fleet-management/>

[5] Reduce the risk of theft

Using GPS always been tracked by its owner and thieves know that vehicles are being tracked and that they have the chance of being caught. Obviously, it will reduce the risk of theft. GPS

help to recover your stolen vehicle and reduce potential losses. GPS have many benefits in fleet vehicle management (Source: <https://www.fleetminder.com.au/gps-vehicle-tracking-devices/benefits-gps-tracking-devices-fleet-management/>).

Applications of GPS-

Global Positioning System (GPS) is very useful. It can be used in different fields. In our vehicle we can use the Auto GPS Navigator to track the route. We can use GPS for Smartphone Mobile Devices and Handheld GPS Devices. The Mobile Device GPS can be used without a signal. Some application can save map for offline usage. Mobile devices use 3 methods to determine GPS location: (i) A-GPS Assisted GPS; (ii) Wi-Fi positioning; (iii) Cellular network position; (iv) The Assisted GPS (A-GPS) uses the cellular network to obtain GPS satellite information.

12.4 HARDWARE REQUIREMENT FOR GPS

A Global Positioning System (GPS) architecture is basically comprised of three segments

- GPS Space Segment
- GPS Ground Segment, and
- GPS User Segment.

The main functions of the Global Positioning System (GPS) Space Segment are to transmit radio-navigation signals. It also stores and retransmit the navigation message sent by the GPS Ground Segment. The GPS Ground Segment is composed of:

Master control station.

Network of monitor stations.

Four ground antennas (which upload the clock and orbit errors, also the navigation data message to the GPS satellites).

The GPS User Segment consists on the millions of receivers. These receivers are performing the navigation, timing or other related functions. (Source: https://gssc.esa.int/navipedia/index.php/GPS_General_Introduction)



Figure 12.4 Example GPS Satellite

(Source: https://gssc.esa.int/navipedia/index.php/GPS_General_Introduction)

There are three general classes of GPS units. We can define these general classes as following:

[1] Navigation/Recreational grade: are GPS units used in vehicles. They are used for recreational purposes. Their range in accuracy is from 5 to 15 meters.

[2] Mapping grade: means a range of positional accuracy. While the Wide Area Augmentation System (WAAS) improves this and it can improve to under 3 meters. You can improve accuracy with help of differential correction. You can use the higher quality antennas to improve the accuracy. The differential GPS, can increase the accuracy to be less a meter.

[3] Survey grade: means that GPS receivers which can receive accuracy levels in the 1-meter range. It can be more enhanced in less than a foot, centimetre, and millimetre. In Survey grade the receiver must record the full range of signal strengths and frequencies (dual-frequencies). It can simultaneously track eight satellites. (Source: <https://guides.libraries.psu.edu/GPS>)

The Global Positioning System, provides three items to its users:

- Position- Latitude, Longitude, and Height
- Velocity- Velocity North, East, and Up
- Time- in UTC (Universal Time Coordinated)

The Global Positioning System gives under 10-meter accuracy of position, under 10 cm/s velocities, & under 0.1 microsecond of time today. The system does this by the antenna of a specialized radio receiver, a GPS receiver. The GPS can receive signals from 4 or more number of satellites. Before 2003 there are 28 active satellites. (Source: <https://www.oc.nps.edu/oc2902w/gps/gpsoview.htm>)

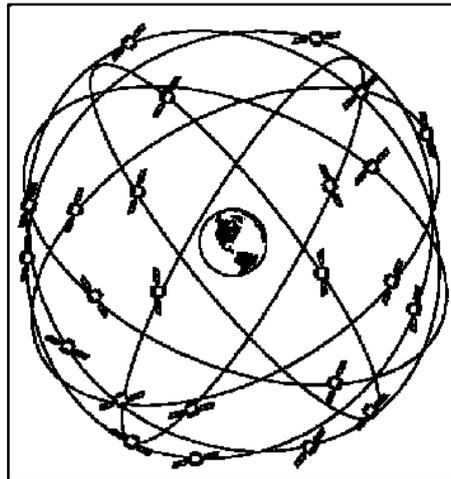


Figure 12.5 GPS Satellite are in high orbit

(Source: <https://www.oc.nps.edu/oc2902w/gps/gpsoview.htm>)

The satellites are in very high orbit of earth. They are about 20,000 km above the earth in 6 orbital planes. They orbit the earth with a period of 12 hours. Always more than 4 satellites are available everywhere on the earth at all times. The satellites are present everywhere and anytime.

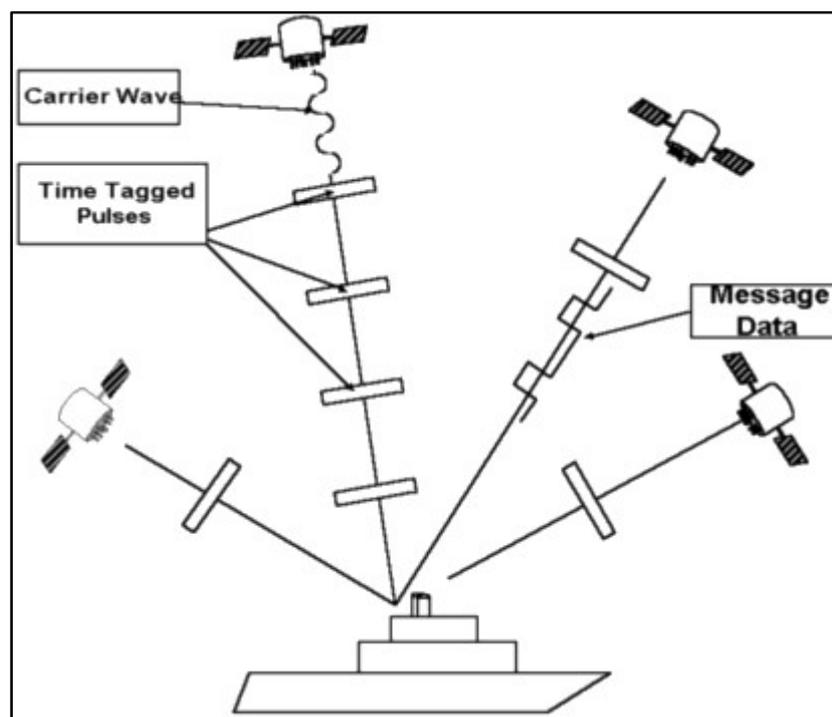


Figure 12.6 GPS Satellite effective transmission process

(Source: <https://www.oc.nps.edu/oc2902w/gps/gpsoview.htm>)

The GPS satellites broadcast the complex signals. These are three effective signals:

- Carrier signal (sine wave).
- Series of pulses.

- Binary information modulated on the signal.

The above diagram shows how the effective signals used by a GPS receiver. It measures the time of the received pulse. The difference in time, is multiplied by the speed of light and this way it calculates the range to the satellite. The speed of light is about 0.3 meter per nanosecond. So very small errors in the receiver's clock can result large range errors.

The carrier wave generally used to determine the velocity of the user. The frequency of the received signal will change accordingly as the receiver is moving. It called Doppler shift. To measure the Doppler frequency at least 4 satellite signals required in the three-dimensional velocity.

To assist the receivers plan satellite tracking an acquire satellites signals, a lower accuracy set of numbers is provided for all the satellites in orbit. It is called the Almanac. This cycles more slowly and takes 12.5 minutes to repeat and this data is updated weekly. Generally, all satellites broadcast the same almanac. The almanac contains some other parameters also. The GPS receiver has 3 functional units:

- Receiver oscillator- usually called the receiver clock,
- Receiver front end- a hardware unit which handles the signal tracking and extraction of the measurements.
- Navigation module software- that generates the position, velocity and time (pvt) output.

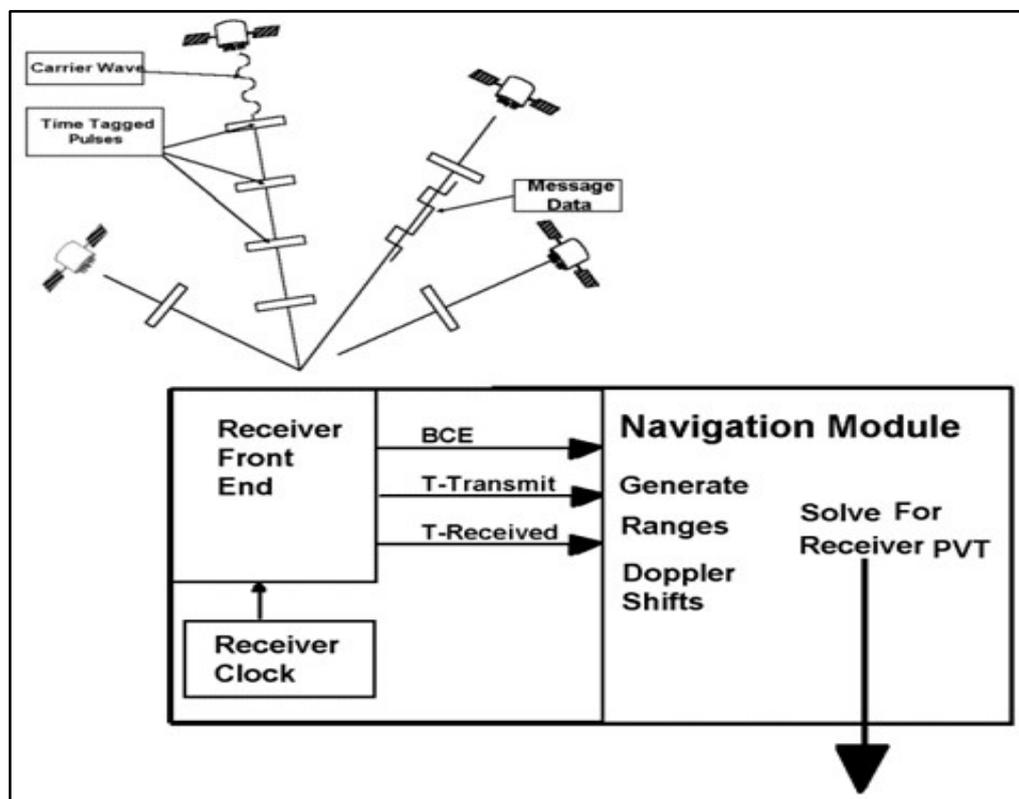


Figure 12.7 GPS receiver functional units

(Source: <https://www.oc.nps.edu/oc2902w/gps/gpsoview.htm>)

The GPS system is divided into three segments:

- The Space Segment or satellites.
- The Control Segment, or ground control stations/ the computation centres/satellites control centre that is responsible for message data.
- The User Segment consisting of all the GPS receivers in use.

12.5 SOFTWARE REQUIREMENT FOR GPS

The GPS Software can be used on a GPS enabled laptop computer. It can also be used in other GPS devices. Many well-known GPS software's are compatible with Windows, Mac Operating System, and Linux. While software like Waze and Google Maps are compatible on mobile phone operating systems. Several navigation software is available in the market but some software's are designed for use on land or water. Following are some Commercial navigation software which is having embedded maps (Source: https://en.wikipedia.org/wiki/GPS_navigation_software):

- DeLorme Street Atlas USA and Topo USA
- HERE
- Microsoft Streets and Trips 2009
- Rand McNally
- Navigon
- Navman
- Magellan
- Mireo
- iGO
- ROUTE 66
- TomTom Navigator
- TomTom Mobile
- TeleType WorldNavigator
- Waze

Commercial Navigation Software-

Following are the Commercial navigation software with scanned/downloaded maps stored in the computer. This software is used in independent stand-alone system (Source: https://en.wikipedia.org/wiki/GPS_navigation_software). Example- OziExplorer, GPSS

Open-Source Navigation Software-

Following are some Free open-source navigation software. This software is used in independent stand-alone system (Source: [https:// en.wikipedia.org /wiki/ GPS_ navigation_ software](https://en.wikipedia.org/wiki/GPS_navigation_software)). Example- (i) OsmAnd (Android) open source, and free (in the F-Droid repository) (ii) MoNav (Cross-platform) open source and free (iii) Navit (Cross-platform) open source and free

Navigation Software with Maps-

Following are Navigation software with maps. This software can be downloaded from a remote server (Source: [https:// en.wikipedia.org /wiki/ GPS_ navigation_ software](https://en.wikipedia.org/wiki/GPS_navigation_software)): Example- (i) Google Earth (Windows, Mac, Linux) (ii) Google Maps (platform independent) (iii) Navit (Cross-platform) open source and free.

12.6 IMPLEMENTATION OF GPS TOOLS

As we know GPS is very useful technology of recent era. There are many important points while implementing and choosing a GPS unit to execute. We should consider the following points at the time of using GPS-

- Waypoints: GPS unit store the Number of waypoints.
- Electronic Compass: determine the direction or location of a user. Electronic compass is the real-time navigation. Which inform the user his cardinal directions? E.g., North, South, East or West.
- Display: You require good quality display, such as widescreen or touch screen.
- Memory: is used to store base maps, or auxiliary data in the GPS Device. You can use SD card as additional memory.
- Accessories: The accessories are used to improve accuracy. For example, antenna, additional battery power, cables used for transfer of GPS data from the unit to computer and/or other devices, and carrying etc.

GPS and Accuracy:

There are many factors which can play important role in the accurate GPS location determination by any GPS devices. These factors are given below:

- Atmosphere effects: It is the ionosphere and troposphere. It can impact the GPS signals by delaying the signal.
- Multipath effect is the reflection of the GPS signal such as buildings, surfaces.
- Differential GPS Corrects the GPS position. It used a series of base stations. It also used to overcome GPS errors.
- Wide Area Augmentation System (WAAS) is a Additional augmentation which is enable satellites to improve accuracy.
- GNSS means satellite position system. It gives global coverage. The global coverage is used to improve GPS accuracy. E.g., USA's NAVSTAR, and Russia's GLONASS.

(Source: <https://guides.libraries.psu.edu/GPS>)

12.7 RECENT TRENDS IN ICT AND GPS

The Developments in GPS (Global Positioning System) is regularly going on. It has greatly changed the geo-location procedures in the survey and utilities mapping industry. The accuracy of GPS is increasing day by day. The cost of GPS is also reducing day by day. The quality of

hand-held GPS devices is significantly less good. The GPS benefited Communications, energy, emergency, transportation and space satellite deployment. The GPS space satellites is now equipped with new features. Now the older GPS satellites are going to be replaced by new one.



Figure 12.8 GPS Application in different area

(Source: <https://www.rewiresecurity.co.uk/blog/future-of-gps-and-global-positioning-locating>)

Working of GPS-

Basically, the global positioning system (GPS) is a network of satellites and receiving devices. It is used to find the location of object on Earth. While many GPS receivers are very accurate. These receivers can establish their location within 1 centimetre (0.4 inches). It gives the location in latitude, longitude, and altitude. These GPS devices can also provide the exist time. GPS includes 24 satellites which circle Earth in precise orbits. Each satellite makes a full orbit of Earth in every 12 hours. These orbiting satellites are constantly sending out radio signals on earth.

GPS receivers are programmed to receive information about where each satellite is at any given moment. A GPS receiver also determines its own location. The radio waves travel at a constant speed, and the receiver can use the time measurements to calculate its distance from each satellite.

By Using multiple satellites, the GPS data can be more accurate. If a GPS receiver calculates its distance from only one satellite, it could be that exact distance from the satellite in any direction. For example, you assume the satellite as a flashlight. When you shine it on the ground, you get a circle of light. With one satellite, the GPS receiver could be anywhere in that circle of light. With two more satellites, there are two more circles. These three circles intersect,

or cross, in only one place. That is the location of the GPS receiver. This method of determining location is called trilateration.

The Aircraft, ships, submarines, trains, and the space shuttle all are using GPS to navigate their direction. Generally, we use GPS while driving the cars and the GPS of the car continuously change the location on GPS electronic map. It provides directions of the car's destination. The car location and car are plotted using satellite data. Some hikers use GPS to help them find their way, especially when they are not on marked trails (Source: <https://www.nationalgeographic.org/encyclopedia/gps/>).

Many times, due to obstacles clear GPS signal is not possible. Gravity can pull the GPS satellites slightly out of orbit and parts of Earth's atmosphere sometimes distort the satellite radio signals. Trees, buildings, and other structures can also block the radio waves. GPS control and monitoring stations, around the world, track the satellites. It continuously monitors their signals. They then accordingly calculate corrections and that are broadcast to GPS receivers. All these corrections improve GPS more accurately.

As we know that the original GPS system began as a project of the U.S. military and the first experimental satellite was launched in 1978. Up to 1994, the 24 GPS satellites were orbiting Earth. However, the first, GPS available for civilian/nonmilitary purpose was not very accurate. It only finds a GPS receiver within approximately 300 meters/1,000 feet. Now GPS is very efficient and provide accurate signal. It is free and available to anyone.

GPS System is basically American. On the other hand, Russia has its own version of a GPS system which is called GLONASS (Global Orbiting Navigation Satellite System). China and the European Union are also working in this direction. GPS device are very efficient and effective. It can be fitted to any vehicle, like a car, bus, truck or airplane's dashboard. (Source: <https://www.nationalgeographic.org/encyclopedia/gps/>)

Triangulation

A global positioning system (GPS) device uses data from satellites to identify a specific point on the Earth. This process is called trilateration. The distance of satellite is measured using radio signals. Trilateration is like a triangulation. It can also measure angles.

GPS technology can be used to track animals as they migrate. Animals, are fitted with GPS. These GPS inform us the animal location and their movements. Biologists can track animals as they migrate to another habitat for a season, move in search of food or shelter, or are forced out of their ecosystem by human activity such as construction. This information is very useful for researcher also.

GPS may also use for early warning system. The Scientists are using GPS to may quickly determine the size of earthquakes. After knowing the size of an earthquake, we can alert the

society by the dangerous ocean waves like tsunamis. When a tsunami reaches land, it can be a huge and destructive wall of water. So, this early warning is crucial in saving lives. The tsunami waves are very distractive and it can move faster than people can run. Source: <https://www.nationalgeographic.org/encyclopedia/gps/>

ISRO is always committed to provide the satellite-based Navigation services. GPS satellites are very important meet the emerging demands of the Civil Aviation requirements. GPS is helpful for the positioning, navigation and timing on the independent satellite navigation system. Now for Civil Aviation requirements, ISRO is working jointly with Airport Authority of India (AAI). They are establishing the GPS Aided Geo Augmented Navigation (GAGAN) system. To fulfil the requirements of the positioning, navigation and timing services based on the indigenous system, ISRO is establishing a regional satellite navigation system called Indian Regional Navigation Satellite System (IRNSS). (Source: <https://www.isro.gov.in/spacecraft/satellite-navigation>). Following are the list of Navigation Satellites of India:

	Launch Date	Launch Mass	Launch Vehicle	Orbit Type	Application	Remarks
IRNSS-1I	Apr 12, 2018	1425 kg	PSLV-C41/IRNSS-1I	GSO	Navigation	
IRNSS-1H	Aug 31, 2017		PSLV-C39/IRNSS-1H Mission		Navigation	Launch Unsuccessful
IRNSS-1G	Apr 28, 2016	1425 kg	PSLV-C33/IRNSS-1G	GEO	Navigation	
IRNSS-1F	Mar 10, 2016	1425 kg	PSLV-C32/IRNSS-1F	GEO	Navigation	
IRNSS-1E	Jan 20, 2016	1425 kg	PSLV-C31/IRNSS-1E	GSO	Navigation	
IRNSS-1D	Mar 28, 2015	1425 kg	PSLV-C27/IRNSS-1D	GSO	Navigation	
IRNSS-1C	Oct 16, 2014	1425 kg	PSLV-C26/IRNSS-1C	GEO	Navigation	
IRNSS-1B	Apr 04, 2014	1432 kg	PSLV-C24/IRNSS-1B	GSO	Navigation	
IRNSS-1A	Jul 01, 2013	1425 kg	PSLV-C22/IRNSS-1A	GSO	Navigation	

*Geo stationary Orbit (GEO)
Geo Synchronous Orbit (GSO)

Figure 12.9 ISRO's List of Navigation Satellites

(Source: <https://www.isro.gov.in/spacecraft/list-of-navigation-satellites>)

NOTE-

The Global Positioning System (GPS), is basically NAVSTAR GPS, It is one of the global navigation satellite systems (GNSS). It provides geolocation and time information. The Obstacles like mountains, buildings or any other blockage may relatively weak the GPS signals. The GPS provides benefits to military, civil, and commercial users. The USA has created the GPS system, to maintains it, and also

makes it freely accessible to anyone with GPS device. (Source: https://en.wikipedia.org/wiki/Global_Positioning_System).

The GPS service is provided by the United States government, so they have the monopoly on the service. They upgrade and degrade the service as per their interest. Therefore, several countries have developed their own satellite navigation systems. Some countries are also in the process of setting up other global or regional satellite navigation systems. The Russia has developed Global Navigation Satellite System (GLONASS). GLONASS can be added to any GPS devices It enables to find the positions more quickly and accurately, within two meters (6.6 ft). The China's BeiDou Navigation Satellite System began global services in 2018. This service is finally deployed in 2020. The European Union, has European Union Galileo positioning system, India has NavIC, and Japan has Quasi-Zenith Satellite System. (Source: https://en.wikipedia.org/wiki/Global_Positioning_System).

Now the much higher accuracy of GPS is possible. Day by day the GPS accuracy is increasing. Now countries are trying to pinpointing within 30 centimetres or 11.8 inches. The sale of GPS enabled devices is increasing rapidly. The jobs are also increasing in this field. The scientist is also innovating new system using GPS technology.

12.8 POINTS TO REMEMBER

- Global Positioning System (GPS) is used for many purposes. It can give the weather condition anywhere in the world, 24 hours a day, 365 days a year. Many satellites are making up the GPS space segment. They are orbiting our earth about 12,000 miles above us. These satellites of Global Positioning System (GPS) are travelling at speeds of roughly 7,000 miles an hour. These satellites are mainly powered by solar energy.
- A Small rocket booster on each satellite always keeps them flying. It guides them in their predefined and correct path and each satellite weighs roughly about 2,000 pounds.
- Global Positioning System (GPS) satellites circle the whole earth twice a day. The user's position displays on his electronic map. Generally, a Global Positioning System (GPS) satellites receiver must be locked on to the signal of at least three satellites to calculate a 2D position and track movement. In view with four more satellites, the receiver can determine the user's 3D position.
- The main functions of the Global Positioning System (GPS) Space Segment are to transmit radio-navigation signals. It also stores and retransmit the navigation message sent by the GPS Ground Segment.
- The GPS User Segment consists on the millions of receivers. These receivers are performing the navigation, timing or other related functions.

- The pedestrians use GPS on mobile devices to navigate walking paths. The GPS devices are being used to monitor human and animal movement.
- There are 3 general classes of GPS units. We can define these general classes as Navigation/Recreational grade, Mapping grade, Survey grade.
- The Global Positioning System, provides 3 items to its users Position - Latitude, Longitude, and Height, Velocity - Velocity North, East, and Up, Time - in UTC (Universal Time Coordinated)
- The Global Positioning System gives under 10-meter accuracy of position, under 10 cm/s velocities, & under 0.1 microsecond of time today. The system does this by the antenna of a specialized radio receiver, a GPS receiver.
- The GPS system is divided into 3 segments, The Space Segment or satellites, the Control Segment, or ground control stations/ the computation centres /satellites control centre that is responsible for message data, and the User Segment consisting of all the GPS receivers in use.
- GPS is a network of satellites and receiving devices. It is used to find the location of object on Earth. These GPS devices can also provide the exist time. GPS includes 24 satellites which circle Earth in precise orbits. Each satellite makes a full orbit of Earth in every 12 hours. These orbiting satellites are constantly sending out radio signals on earth.
- By Using multiple satellites, the GPS data can be more accurate. If a GPS receiver calculates its distance from only one satellite, it could be that exact distance from the satellite in any direction. For example, you assume the satellite as a flashlight. When you shine it on the ground, you get a circle of light. With one satellite, the GPS receiver could be anywhere in that circle of light. With two more satellites, there are two more circles. These three circles intersect, or cross, in only one place. That is the location of the GPS receiver. This method of determining location is called trilateration.
- Many times, due to obstacles clear GPS signal is not possible. Gravity can pull the GPS satellites slightly out of orbit and parts of Earth's atmosphere sometimes distort the satellite radio signals. Trees, buildings, and other structures can also block the radio waves.
- GPS System is basically American. On the other hand, Russia has its own version of a GPS system which is called GLONASS (Global Orbiting Navigation Satellite System). China and the European Union are also working in this direction.

12.9 GLOSSARY

- Global Positioning System (GPS)- is a satellite-based navigation system. It was initially developed for the military applications. From the year 1980, the Global Positioning System (GPS) is available for civilian use also.

- GPS and Accuracy- There are many factors which can play important role in the accurate GPS location determination by any GPS devices. These factors are atmosphere effects, Multipath effect, Wide Area Augmentation System (WAAS).
- GPS Memory- is used to store base maps, or auxiliary data in the GPS Device. You can use SD card as additional memory.
- Triangulation- A global positioning system (GPS) device uses data from satellites to identify a specific point on the Earth. This process is called trilateration. The distance of satellite is measured using radio signals. Trilateration is like a triangulation
- Mobile Device GPS- We can use GPS for Smartphone Mobile Devices and Handheld GPS Devices. The Mobile Device GPS can be used without a signal. Some application can save map for offline usage. Mobile devices use 3 methods to determine GPS location: (i) A-GPS Assisted GPS; (ii) Wi-Fi positioning; (iii) Cellular network position.

12.10 CHECK YOUR PROGRESS

Descriptive Type Questions-

- a) How GPS calculate the user's exact location. How it calculates a 2D and 3D position and track movement?
- b) What is the architecture of Global Positioning System (GPS)? How the GPS Ground Segment is composed? Explain the role of ground antennas?
- c) How Global Positioning System provides its users Position like Latitude, Longitude, Height, Velocity and Time - in UTC (Universal Time Coordinated)? Explain.
- d) How many functional units are in the GPS receiver? Explain the function of receiver oscillator, receiver front end, and navigation module.
- e) What is the Global Positioning System (GPS)? How many segments we can divided the GPS System?
- f) How the GPS receiver perform the time measurements to calculate its distance from each satellite.
- g) What is the different GPS Software? Which operating system is more compatible with GPS software?
- h) How many software are compatible on mobile phone operating systems? How GPS software's are designed for use on land or water?
- i) What is the different Commercial navigation software used in independent stand-alone system and Free open-source navigation software?

Objective Type Questions-

- a) Global Positioning System (GPS) are mainly powered by
- b) GPS calculate the user's exact
- c) The position of GPS user means latitude, longitude and altitude.

- d) A Global Positioning System (GPS) architecture is basically comprised of three segments
... .. , ,
- e) The is very helpful to track locations.
- f) is a Additional augmentation which is enable satellites to improve accuracy.
- g) determine the direction or location of a user and real-time navigation.
- h) Original GPS system began as a project of the and the first experimental satellite was launched in 1978.
- i) Navigation software with maps downloaded from a remote server
- j) Global Positioning System (GPS) is a satellite-based navigation system. (True/False)
- k) Navigation/Recreational grade are GPS units used in vehicles. (True/False)
- l) Mapping grade is not related to the range of positional accuracy. (True/False)
- m) Survey grade means that GPS receivers can receive accuracy levels in the 1-meter range. (True/False)
- n) The Aircraft, ships, submarines, trains, and the space shuttle all are using GPS to navigate their direction. (True/False)

Answer (Objective Type Questions)-

- [a] Solar energy [b] Location [c] 3D
- [d] GPS Space Segment, GPS Ground Segment, GPS User Segment [e] GPS
- [f] Wide Area Augmentation System (WAAS) [g] Electronic Compass
- [h] U.S. military [i] Google Earth, Google Maps, Navit [j] True
- [k] True [l] False [m] True [n] True

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