# PROGRAMME PROJECT REPORT

**(includes curriculum and syllabus)**



# B.Sc. (Cyber Security)

**Submitted**

**To**

**The UGC – DEB**

*(ODL) - MODE*

**MADHYA PRADESH BHOJ (OPEN) UNIVERSITY,**

**Raja Bhoj Marg Kolar Road, BHOPAL (M.P.)**

**PROGRAMME PROJECT REPORT**

**Name of the Programme:  B.Sc.(Cyber Security)**

**Introduction :**

B.Sc.(Cyber Security)   is a postgraduate program that focuses on developing the skills and knowledge required to manage and analyze information technology  in  various industries. The program covers a wide range of topics such as software development, database management, computer networks, cybersecurity, and artificial intelligence.

Students who enroll in an B.Sc. (Cyber Security) program are  typically individuals who already have  an undergraduate  degreein computer science, information technology, or a related field. The program typically takes one to two years to complete, and students are required to complete coursework, research projects, and a dissertation.

The program is designed to equip graduates with the necessary skills to become IT professionals, and prepares them for roles such as systems analyst, database administrator, network administrator,  cyber security specialist, and software developer. An B.Sc. (Cyber Security) degree is highly valued in the job market, and graduates can expect to earn competitive salaries in their chosen field.

**(i) (a) Programme's Mission**: The mission of an B.Sc. (Cyber Security)  program is to provide students with a comprehensive understanding of information technology and its applications in various industries. The program aims to equip students with the necessary skills to analyze, design, and develop IT systems that are efficient, effective, and secure.

The program is designed to prepare students for careers in the rapidly evolving field of information technology, where there is a constant demand for professionals who can adapt to new technologies and solve complex problems. The program emphasizes practical, hands-on experience, and encourages students  to  engage  in research and development activities.

In addition, the program aims to develop students' communication and teamwork skills, as these are essential for success in the field of IT. Graduates of the program are expected to be leaders in their field, with the ability to innovate, manage and lead IT projects.

Overall, the mission of an B.Sc.(Cyber Security)  program is to produce graduates who are  well-rounded IT professionals, capable of contributing to the growth and success of organizations in various industries.

**(b) Objectives:**

The objectives of an B.Sc.(Cyber Security) in IT (Information Technology) program vary depending on the specific program and institution offering it. However, some common objectives of B.Sc.(Cyber Security) programs include:

- Developing advanced knowledge and skills: B.Sc.(Cyber Security) programs aim to provide students with advanced knowledge and skills in areas such as computer networks, database management, programming, artificial intelligence, cybersecurity, and more.

- Preparing for leadership roles: B.Sc.(Cyber Security) programs often prepare students for leadership roles in the IT industry by providing them with the knowledge, skills, and confidence to lead teams and make strategic decisions.

- Promoting innovation: B.Sc.(Cyber Security) programs encourage students to think creatively and innovatively by exposing them to cutting-edge technologies and research.

- Enhancing career prospects: B.Sc.(Cyber Security) programs are designed to enhance students' career prospects by providing them with specialized knowledge and skills that are in high demand in the IT industry.

- Encouraging lifelong learning: B.Sc.(Cyber Security) programs promote a culture of lifelong learning by providing students with the tools and resources they need to stay up-to-date with the latest advancements in the IT industry.

**(ii) Relevance of the Programme with HEI's Mission and Goals**: The relevance of an B.Sc.(Cyber Security) program with an HEI's (Higher Education Institution) mission and goals depends on the specific institution's mission and goals. However, in general, B.Sc.(Cyber Security) programs are highly relevant to many HEI's missions and goals for the following reasons:

Meeting the needs of the IT industry: Many HEIs aim to prepare their graduates to meet the needs of the industries they will work in. B.Sc.(Cyber Security) programs do exactly that by equipping students with advanced knowledge and skills in areas such as computer networks, cybersecurity, and artificial intelligence, which are highly sought after by employers in the IT industry.

Supporting research and innovation: Many HEIs aim to support research and innovation by providing their students with access to cutting-edge technologies and research facilities. B.Sc.(Cyber Security) programs often involve research projects, internships, and other opportunities for students to explore and develop innovative solutionsto real-world problems.

Enhancing the institution's reputation: Many HEIs aim to enhance their reputation by offering high-quality academic programs that produce successful graduates. B.Sc.(Cyber Security) programs are highly regarded in the IT industry, and graduates of these programs are often sought after by employers, which can enhance the institution's reputation.

Encouraging lifelong learning: Many HEIs aim to promote a culture of lifelong learning by providing their students with the tools and resources they need to continue learning throughout their careers. B.Sc.(Cyber Security) programs often involve ongoing professional development opportunities and access to industry experts, which can help students stay up-to-date with the latest advancements in the IT industry.

Overall, an B.Sc.(Cyber Security) program can be highly relevant to an HEI's mission and goals, particularly if the institution aims to prepare its graduates for successful careers in the IT industry, support research and innovation, and promote lifelong learning.

### (iii) Nature of prospective target group of learners:

The prospective target group of learners for an B.Sc.(Cyber Security) program can vary depending on the specific program and institution offering it. However, in general, the target group of learners for an B.Sc.(Cyber Security) program are individuals who:

- Have an undergraduate degree in computer science, information technology, or a related field: B.Sc.(Cyber Security) programs typically require applicants to have an undergraduate degree in a relevant field. This ensures that students have a solid foundation in IT fundamentals before embarking on more advanced coursework.

- Are interested in advancing their knowledge and skills in IT: B.Sc.(Cyber Security) programs are designed for individuals who want to deepen their understanding of IT concepts, technologies, and applications. Prospective students may be interested in pursuing careers in areas such as software development, network administration, cybersecurity, or data analytics.

- Are motivated and self-directed learners: B.Sc.(Cyber Security) programs require a high level of self-direction and motivation, as students must complete complex coursework, research projects, and other assignmentswith minimal supervision.

- Have strong analytical and problem-solving skills: B.Sc.(Cyber Security) programs involve complex problem-solving and require students to think critically and analytically. Prospective students should have strong analytical and problem-solving skills to succeed in the program.

- Are interested in pursuing leadership roles in the IT industry: B.Sc.(Cyber Security) programs often prepare studentsfor leadership roles in the IT industry by providing them with the knowledge, skills, and confidence to lead teams and make strategic decisions. Prospective students who are interested in pursuing leadership roles in the IT industry may find an B.Sc.(Cyber Security) program particularly appealing.

Overall, the target group of learners for an B.Sc.(Cyber Security) program is typically composed of motivated, self-directed learners with a strong foundation in IT fundamentals who are interested in advancing their knowledge and skills in IT and pursuing careers in the field.

**(iv) Appropriateness of programme to be conducted in the Open and Distance Learning mode to acquire specific skills and competence:**

The B.Sc.(Cyber Security) program can be appropriately conducted in the Open and Distance Learning (ODL) mode to acquire specific skills and competence. Here are some reasons why:

- Flexibility: The ODL mode provides flexibility in terms of time, pace, and place of learning, which is especially important for learners who are already working or have other commitments. This mode allows learners to design their own study schedules and access course materials at their convenience, which can help them to balance their work, family, and educational commitments.

- Access to learning resources: ODL mode can provide access to a wide range of learning resources, including digital textbooks, audio and video lectures, interactive simulations, and virtual laboratories. This mode allows learners to access these resources from anywhere, which can help them to deepen their understanding of key concepts and develop specific skills and competencies.

- Personalized learning: ODL mode can provide personalized learning experiences to learners by using adaptive learning technologies, providing individual feedback, and offering personalized tutoring. This mode can help learners to focus on their specific needs and interests and acquire the skills and competence they need to succeed in their chosen field.

- Cost-effective: ODL mode can be a cost-effective option for learners who are unable to attend traditional, on-campus programs. This mode can reduce the cost of tuition, accommodation, and transportation, making it more accessible to learners from diverse socioeconomic backgrounds.

- Practical components: Although some practical components of the B.Sc.(Cyber Security)program may require access to laboratory equipment, there are still many theoretical components of the program that can be delivered effectively through the ODL mode. Furthermore, some universities offer online laboratories and simulations that can be used to supplement or replace the practical componentsof the program.

Overall, the B.Sc.(Cyber Security) program can be appropriately conducted in the ODL mode, providing learners with the opportunity to acquire specific skills and competence in a flexible, accessible, personalized, and cost-effective manner.

**(v) Instructional Design:** The B.Sc.(C.S.). programme is a three-year degree programme of 132 credits. The course material for the programme has been developed in-house with contributions from seasoned academicians as well. The instructional design comprises all learning activities i.e., reading and comprehending the SLM, availing audio-visual aids to enhance knowledge, attending counselling sessions and preparing assignments.

The Programme is of 3  year duration with semester examinations. The maximum period  allowed  is  6 years(double the duration). The Programme structure is as below.

**B.Sc. (Cyber Security)**

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Theory | | Practical | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | BSCS0101 | ENVIRONMENT SCIENCE | 4 | 3 | 0 | 0 | 5 | 60 | 40 | 0 | 0 | 100 |
| 2 | BSCS0102 | Computer Organization | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 3 | BSCS0103 | Fundamental of Computer Networking | 4 | 3 | 0 | 3 | 3 | 60 | 40 | 60 | 40 | 200 |
| 4 | BSCS0104 | Principles of Cyber Security | 4 | 4 | 2 | 5 | 6 | 60 | 40 | 60 | 40 | 200 |
| 5 | BSCS0105 | Introduction to Python Programming | 4 | 4 | 2 | 4 | 4 | 60 | 40 | 60 | 40 | 200 |
| | | TOTAL | 20 | 20 | 4 | 12 | 28 | 300 | 200 | 180 | 120 | 800 |

The table title rows: M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL / B.Sc. IN CYBER SECURITY SEMESTER-I / Examination Scheme

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Th. | Tut. | Pr. | Total (hr.) | CIE Th. | End Sem Th. | CIE Pr. | End Sem Pr. | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL** | | | | | | | | | | |
| | | **B.Sc. IN CYBER SECURITY SEMESTER-II** | | | | | | | | | | |
| | | | | | Teaching scheme (per week) | | | Theory | | Practical | | |
| 1 | BSCS0201 | **Cyber Attacks & Counter Measures: User Perspective** | 4 | 3 | 0 | 4 | 7 | 60 | 40 | 60 | 40 | 200 |
| 2 | BSCS0202 | **Data Structure** | 4 | 3 | 0 | 2 | 5 | 60 | 40 | 60 | 40 | 200 |
| 3 | BSCS0203 | **Basic of Data Science** | 4 | 3 | 0 | 0 | 3 | 60 | 40 | 0 | 0 | 100 |
| 4 | BSCS0204 | **Computational Number Theory and Cryptography** | 4 | 3 | 0 | 2 | 5 | 60 | 40 | 60 | 40 | 200 |
| 5 | BSCS0205 | Communication Skills- I | 4 | 3 | 0 | 0 | 5 | 60 | 40 | 0 | 0 | 100 |
| | | **TOTAL** | **20** | **15** | **0** | **08** | **25** | **300** | **200** | **180** | **120** | **800** |

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Th. | Tut. | Pr. | Total (hr.) | CIE Th. | End Sem Th. | CIE Pr. | End Sem Pr. | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL** | | | | | | | | | | |
| | | **B.Sc. IN CYBER SECURITY SEMESTER-III SYLLABUS** | | | | | | | | | | |
| | | | | | Teaching scheme (per week) | | | Theory | | Practical | | |
| 1 | BSCS0301 | Mobile Concepts and Security | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 2 | BSCS0302 | **Operating Systems** | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 3 | BSCS0303 | **Computer Networks** | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 4 | BSCS0304 | **Application and Network Security** | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 5 | | Communication Skills- II | 2 | 2 | 0 | 0 | 2 | 60 | 40 | 0 | 0 | 100 |
| | | **TOTAL** | **22** | **18** | **0** | **08** | **26** | **300** | **200** | **120** | **80** | **700** |

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | BSCS0401 | Data Analysis using Python | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 2 | BSCS0402 | Cyber Attacks & Counter | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 3 | BSCS0403 | Data Warehousing and Data Mining | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 4 | BSCS0404 | Artificial Intelligence | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 5 | BSCS0405 | Human Skill Development-II(PART2) | 4 | 3 | 2 | 0 | 5 | 60 | 40 | 0 | 0 | 100 |
| | | TOTAL | 24 | 19 | 2 | 8 | 29 | 300 | 200 | 120 | 80 | 700 |

**M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL**

**B.Sc. IN CYBER SECURITY SEMESTER-IV SYLLABUS**

(table above belongs to Semester-IV)

**M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL**

**B.Sc. IN CYBER SECURITY SEMESTER-V SYLLABUS**

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | BSCS0501 | Software Engineering | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 2 | BSCS0502 | Machine Learning | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 3 | BSCS0503 | Fundamentals of Web Applications & Security | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 4 | BSCS0504 | Cloud Computing | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| | | TOTAL | 22 | 16 | 0 | 12 | 28 | 240 | 160 | 180 | 120 | 700 |

| | | | | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| Sr. No. | Sub. Code | Name of the subject | CREDIT | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | BSCS0601 | Deep Learning | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 2 | BSCS0602 | Computer Graphics | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 0 | 0 | 100 |
| 3 | BSCS0603 | Networking Concepts and Security | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 4 | BSCS0604 | Major Project | 8 | 0 | 0 | 16 | 16 | 0 | 0 | 0 | 200 | 200 |
| | | TOTAL | 24 | 12 | 0 | 24 | 36 | 180 | 120 | 60 | 240 | 600 |

**M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL**

**B.Sc. IN CYBER SECURITY SEMESTER-VI SYLLABUS**

**(b)**

**(c) Duration of the Programme:** The Duration of the Programme is Three years.

**(d) Faculty and Support Staff Requirement:** At present, there are three faculty members in the Department. The Department have all support staff for its the smooth functioning.

**(e) Instructional Delivery Mechanism:**

The instructional delivery mechanisms of the program should be designed to cater to the diverse needs of the learners, provide flexibility, and ensure effective learning outcomes. The program should also provide adequate support services such as academic counselling, technical support, and mentorship to ensure that learners receive the necessary guidance and assistance throughout the program.

As the University functions in the Open and Distance Learning mode, the programmes that we offer are designed to meet the varied requirements of the distant learner. Keeping this in view, the course material developed by the Department is learner friendly. Each course is divided into four to five blocks, which are further divided into units. Each Block consists of three to four units. This number has been determined taking into consideration the learning capabilities of our learners. The structure of the unit is in line with the guidelines laid down by the DEB-UGC, the apex regulatory body of Open and Distance Learning. The content is kept simple and lucid and follows the self-instructional pattern. Each lesson includes a number of self-assessment questions along with hint answers so that the students are able to track their progress as they proceed with the lesson. At the end of each unit, a list of other relevant books is also provided. Besides providing quality study material to our learners, the Department, following the ODL pattern, has defined its programmes in the terms of credits. In the ODL system, one credit is equivalent to 30 study hours i.e. the study input required for

completion of the programme. Normally the B.Sc.(Cyber Security) programme is a 132-credit programme. This comprises all learning activities ie., reading and comprehending the SLM, availing audio-visual aids to enhance knowledge, attending counselling sessions and preparing assignments. Thus, in the B.Sc.(Cyber Security) programme, a learner is expectedto put in 2160 study hours to complete the programme in two years' time.

**(vi) Procedure for admission, curriculum transaction and evaluation:**

**Admission Process :**

Notification issued by the University in Regional and National Newspapers and in the official website. Admission process is online through the MPOnline Portal. Payment of fee through online (various options like net banking etc.). Submission of the printout of the application by the candidate to concern study center along with original documents for eligibility, date of birth etc., and along with fee paid receipt. After the Verification of applications- for fulfillment of eligibility criteria (marks cards) documents, fee paid details. Approval of the admission and issue of self-learning material (Study Materials) to the students.

**Contact Programmes :**

The personal contact programme in every course shall extend over a period of 13 working days in each semester and is usually conducted at the beginning of the session. The students are expected to come prepared in the class in order to discuss their problems meaningfully. 75% attendance in the personal contact programme is mandatory.

**Eligibility:** 12th with Mathematics

**Fee Structure:  B.Sc.( Cyber Security)**

Rs. 9000: Per Year

**Evaluation norms:** A learner will be evaluated on the basis of Assignments and term-end examination. Assignments carry 30% weightage whereas the term end examination carry 70% weightage.

**Evaluation system:**
- Students shall have a minimum of 50% of total marks of the University examinations in each Course. The overall passing minimum is 50% both in aggregate of Continuous Internal Assessment and External Examination in each Course.
- Every course shall have two components of assessment namely,
  - Continuous Internal Assessment "CIA": This assessment will be carried out throughout the semester as per the Academic Schedule.
  - End Semester Examination "ESE": This assessment will be carried out at the end of the Semester as per the Academic Schedule.

**Continuous Internal Assessment "CIA":**

- Continuous Internal Assessment for each Course shall be by means of Written Tests/ Assignments, and Class Tests for a total mark of 30.
- Continuous Internal Assessment for each Course shall be the responsibility of the concerned CourseFaculty.

- The valued answer papers/assignments shall be given to the students after the valuation is completed and they be asked to check and satisfy themselves about the marks they scored.
- All records in respect of Continuous Internal Assessments shall be in the safe custody of the PI for at least one year after the assessment.

**Theory course assessment weightages:**

The general guidelines for the assessment of Theory Courses, Department Electives and Non – Department Electives shall be done on a continuous basis as given in Table.

**Table : Weightage for Assessment**

| S.No. | Assessment | Weightage | Duration |
|---|---|---|---|
| 1. | First Periodical Assessment | 10% | 2 periods |
| 2. | Second Periodical Assessment | 10% | 2 Periods |
| 3. | Practical/Project/ Lab | 5% | -- |
| 4. | End Semester Exam | 70% | 2 to 3 hours |

**Grading System**

Based on the student's performance in each semester, grade is awarded with a final letter grade at the end of the exam evaluation of each Course. The letter grades and the corresponding grade points are as follows.

**Table 3: Grading system**

| Range of Marks | Letter Grade | Grade Points | Remarks |
|---|---|---|---|
| 90 – 100 | S | 10 | Outstanding |
| 80-89 | A | 09 | Excellent |
| 70-79 | B | 08 | Very Good |
| 60-69 | C | 07 | Good |
| 50-59 | D | 06 | Average |
| 40-49 | E | 05 | Pass |
| <40 | U | 00 | To Reappear for End-Semester Examination |

**GPA and CGPA**

Grade Point Average (GPA) is the ratio of the sum of the product of the number of credits Ci of course "i "and the grade points Pi earned for that course taken over all courses "i" registered and successfully completed by the student to the sum of Ci for all "i". That is,

$$GPA = \frac{\sum_1^n C_i\ P_i}{\sum_1^n C_i}$$

Cumulative Grade Point Average (CGPA) will be calculated in a similar manner, in any semester, considering all the courses enrolled from the first semester onwards. The Grade card will not include the computation of GPA and CGPA for courses with letter grade "U" until those grades are converted to the regular grades.

**Grade Sheet**

Based on the performance, each student is awarded a final letter grade at the end of the semester in each course. The letter grades and corresponding grade points are given in Table 3. A student is considered to have completed a course successfully and earned credits if he/she secures a letter grade other than U in that course. After results are declared, grade sheet will be issued to each student which will contain the following details:

- Program and discipline for which the student has enrolled.
- Semester of registration.
- The course code, name of the course, category of course and the credits for each course registered in that semester
- The letter grade obtained in each course
- Semester Grade Point Average (GPA)
- The total number of credits   earned  by  the  student  up  to  the  end  of  that semester in each of the course categories.
- The Cumulative Grade Point Average (CGPA) of all the courses taken from the first semester.
- Credits earned under Non – CGPA courses.
- Additional credits earned for   the  respective  UG  degree  or  respective  Degree with Minor specialization

**Class/Division**

Classification is based on as follows: CGPA ≥ 8.0: First

Class with Distinction

**6.5** ≤ CGPA <8.0: First Class

5.0 ≤ CGPA <6.5: Second Class

(i) Further, the award of 'First class with distinction' is subject to the candidate becoming eligible for the award of the degree, having passed the examination in all the courses in his/her first appearance with effect from II semester and within the minimum duration of the programme.

(ii) The award of 'First Class' is further subject to the candidate becoming eligible for the award of the degree, having passed the examination in all thecourses within 5 years.

(iii) The period of authorized break in study will not be counted for the purpose of the above classification.

**Eligibility For The Award of Degree**

A student will be declared to be eligible for the award of the B.Sc.(Cyber Security) degree ifhe/she has Registeredand successfully obtained credit for all the core courses:

➢ Successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline of his/her study within the stipulated time:

➢ Has no dues to all sections of the institute including hostels and has no disciplinaryaction pending against him/her.

➢ The award of the degree must be recommended by the Academic Council and approved bythe Board of Management of the university.

**Re-View Of Answer Scripts / Single Valuation**

If any student feels aggrieved on the final outcome of the assessment in any course, the student shall apply to the Controller of Examinations, along with the prescribed fee, for the review of Tern End examination answer script, within the stipulated time after the announcement of the results of the examinations. The Controller of Examinations shall facilitate the review of the answer script jointly to be carried out by the student and the faculty detailed for this purpose. If any discrepancy is noticed during review the same shall be rectified and the originally awarded grade accordingly amended.

**(vii) Requirement of the laboratory support and library resources:**

**Internet Leased Line**

**Computer Lab:** The University has most modern high-tech Computer Lab with 24 hrs. Internet facility

for studying and R&D activities. The state-of-the-art facility features hardware & software that is geared to specific academic programmes.

**Research Lab:** University equipped with round the clock available Hi-tech research Lab. which includes latest configured systems with Hi-speed internet facility loaded with latest software for research purpose.

**Library:** The University library is the hub of knowledge with more than 105832 books, Online Journals/Magazines, Back Volumes:, Thesis & Dissertations:, News Papers: 12, Book Bank: 25850 are conveniently accessible for the students and staff of MPBOU. Library includes Main reading area, separate reading area and reference section.

The MPBOU system consists of a Central Library and Departmental Libraries which collectively support the teaching, research and extension programmes of the Institute. All students, faculty members and employees of the Institute are entitled to use the Library facilities enrolling membership.

**Internet Facilities:** One Gbps – Lease Line Link are available at the university. University is fully networked with a campus wide network interconnecting all departments. Campus is fully Wi-Fi with high Speed internet connection available round-d-clock.

**MS TEAMS Platform:** The University has acquired the Zoom platform license and has gone 100% virtual in terms of delivering the regular classes during the COVID lockdown. This has given enough experience for the faculty and expertise to handle the platform for online learning. More than 150 guest lecturers have been organised in the brief period of three weeks inviting industry experts. The MPBOU team is now digitally empowered to conduct OL classes on this virtual platform on a regular basis which shall make the learning process very effective.

**LMS:** The Institute is using MOODLE and Microsoft Teams for Online teaching andto conduct test and Assignments

**(Viii) Cost estimate of the Programme and the provisions:**

The B.Sc.(Cyber Security) in English has been prepared in-house. The internal faculty has made contribution through units. The Department has utilized the acumen and expertise of seasoned academicians in the development of the course material. The expenses incurred in outsourcing units is as follows:

Cost Estimates for Development of the Programme:

| Programme | Programme Development | Delivery | Total |
|-----------|----------------------|----------|-------|
| M.Sc. Information Technology | 5,00000/- | 3,00000/- | 8,00000/- |

**(ix) Quality Assurance Mechanism and expected programme outcomes:**

Quality assurance mechanisms are important in ensuring that B.Sc.(Cyber Security) programs meet the desired standards and deliver the expected outcomes. The following are some of the quality assurance mechanisms that can be put in place for an B.Sc.(Cyber Security) program:

- Curriculum design and review: The curriculum of an B.Sc.(Cyber Security) program should be designed to meet the needs of the industry and reflect the latest developments and trends in the field. Regular reviews shouldbe conducted to ensure that the curriculum remains relevant and up-to-date.

- Faculty qualifications and training: Faculty members should have the necessary qualifications and experience to teach the courses in the program. They should also receive regular training to enhance their teaching skills and keep up with the latest developments in the field.

- Student assessment: A variety of assessment methods should be used to evaluate student learning and mastery of the course material. These assessments should be aligned with the program's learning outcomes.

- Student support: Adequate support should be provided to students, including academic advising, mentoring, and counseling services. The program should also provide access to resources such as a library, online databases, and study materials.

- Continuous improvement: The program should have a process in place for continuous improvement, which involves gathering feedback from students, alumni, and employers to identify areas of strength and weakness and make necessary adjustments.

The expected program outcomes of an B.Sc.(Cyber Security) program may include the following:

- Advanced knowledge and skills in IT: Graduates of an B.Sc.(Cyber Security) program should have advanced knowledge and skills in areas such as software development, network administration, cyber security, and data analytics.

- Critical thinking and problem-solving skills: Graduates should be able to apply critical thinking and problem-solving skills to analyze complex IT problems and develop effective solutions.

- Effective communication skills: Graduates should be able to communicate effectively with both technical and non-technical stakeholders, including colleagues, clients, and managers.

- Leadership and teamwork skills: Graduates should be able to work effectively in teams and demonstrate leadership skills in managing projects and teams.

- Ethical and professional conduct: Graduates should be aware of ethical and professional standards in the IT industry and demonstrate ethical and professional conduct in their work.

Overall, an B.Sc.(Cyber Security) program should aim to produce graduates who are well-prepared for careers in the IT industry and can make significant contributions to the field. Quality assurance mechanisms can help ensure that the program meets these goals and delivers the expected outcomes.

# DETAILLED SYLLABUS

## B.Sc. IN CYBER SECURITY SEMESTER-I SYLLABUS

### BSCS0102: Computer Organization and Architecture

**Unit- I**

Register transfer language, Bus and memory transfer, Arithmetic, micro operation, Logic micro operation, Shift micro operation, Arithmetic logic shift unit

**Unit- II**

Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory reference instruction, I/O and interrupt, Design of basic computer and Accumulator logic.

**Unit- III**

Machine language, assembly language, Assembler programming, arithmetic and logic operation, I/O programming. Micro programmed and hardwired control unit, General register organization of C.P.U, Stack organization, Instruction format, Addressing modes, Program control, RISC v/s CISC.

**Unit- IV**

Parallel processing, Pipelining, Arithmetic pipelining, Instruction pipeline, RISC pipeline, Vector processing, Memory interleaving, Array processor, multiprocessor.

**Unit- V**

Peripheral devices, I/O interfaces, Asynchronous Data transfer DMA, Priority Interrupt, I/O processor, Multiprocessor system organization and Data communication processor. Auxiliary memory, Microcomputer, memory, Memory hierarchy, Associative memory, Virtual memory, Cache memory, Memory management hardware.

**References:**

1. Morris Mano "computer System Architecture",
2. Computer Organization & Architecture, W. Stallings, ", PHI.
3. Computer Architecture and Organization, J. P. Hayes, McGraw Hill,
4. Computer Architecture, A Quantitative Approach, John L. Hennessy & David A. Patterson,",Morgan Kaufmann, .
5. Modern Computer Architecture ,Rafiquzamman and Chandra,". GalgotiaPublication.

## BSCS0103 Fundamentals of Computer Networking

**Unit 1: Introduction to Networking**
Learning Objectives, Introduction to Networking,Components of Networking, Local and Wide Area Network, Different Computing Models of Network, Let Us Sum Up, Check Your Progress, Further Reading, Assignments, Activitie

**Unit 2: Intranets and Internets Network Services**
Learning Objectives, Intranets and Internets Network services, File services, File transfer protocol, Printing services, Application services, TELNET service, Let us sum up, Check your Progress, Further Reading, Assignments, Activities

**Unit 3: Fundamental of Communication Theory**
Learning Objectives, Fundamental of communication theory, Analog and digital signal, Periodic and aperiodic signal, Transmission Impairment, Let us sum up, Check your Progress, Further Reading, Assignments, Activities

**Unit 4: Throughput**
Learning Objectives,Throughput, Propagation Speed, Waveforms, Bandwidth, Let us sum up, Check your Progress: Possible Answers, Further Reading, Assignments, Activities

**BSCS0104: Paper Name - Principles of Cyber Security**

**Unit 1: Cyber Security Essentials**
Learning Objectives , What is Cyber Security? ,Indian Cyberspace , Security Concepts ,Basic Cryptography , Public Key Infrastructure , Let Us Sum Up ,Check Your Progress: Possible Answers

**Unit 2: Attack Vectors, Threat, Risk And Vulnerability**
Learning Objectives , Introduction, Key Terminologies, Attack, Risk Assessment , Let Us Sum Up,Check your Progress: Possible Answers

**Unit 3: Advance Persistent Threat And Cyber Kill Chain**
Learning Objectives , Understanding the Problem, Advance Persistent Threat,Cyber Kill Chain, Let US Sum Up, Check your Progress: Possible Answers

**Unit 4: Cyber Security Framework Learning Objectives**
Introduction, Cyber security Policy, Cyber security Regulations in INDIA, Cyber security Regulations In Other Countries, Cyber security Policy Framework, Let us sum up, Check your progress: Possible answers

# BSCS0105 Paper Name - Python Programming

**Unit 1: Introduction, Variables, and Data Types**
History, Features, Installation and Execution, Hello World! , Input and Output, Basic Data Types and Operators , Strings, Compound Data Types

**Unit 2: Control Structures**
Conditionals ,Loops

**Unit 3: Functions, Modules, and Packages**
Functions, Modules, Packages

**Unit 4: Files and Regular Expressions**
File Input/Output , Text Processing, Pattern Matching and Regular Expressions, Application: Querying Publication Data

**Unit 5: Django Framework**
Installing and Running Django, Creating and Running a Web Application , Parameter Passing with GET ,References for Further Learning


# B.Sc. IN CYBER SECURITY SEMESTER-II SYLLABUS


## BSCS0201: Cyber Attacks & Counter Measures: User Perspective


**Unit 1:**
Learning Objectives, Introduction, Cyber Attack, Types of Cyber Attack and Threats, Motivation, Let us sum up, Check your Progress: Possible Answers, Assignments, Activities

**Unit 2:**
Learning Objectives, Introduction to Asset, Vulnerability and Threats, Risk Management, Let us sum up, Assignments

**Unit 3: Organization Security & Frameworks**
Learning Objectives**,** Introduction to Information Security Framework**,** Policies, Standards, Baselines, Guidelines and Procedures**,** Let us sum up**,** Assignments

**Unit 4: Introduction toCryptography**
Learning Objectives, Introduction, Definition of Computer Forensics, Cyber Crime, Evolution of Computer Forensics, Stages of Computer Forensics Process, Benefits of Computer Forensics, Uses of Computer Forensics, Objectives of Computer Forensics, Role of Forensics Investigator, Forensics Readiness, Issues Facing Computer Forensics, Let us Sum-up, Further Readings, Assignments

## BSCS0202: Data Structure

### UNIT 1 - INTRODUCTION TO 'C' LANGUAGE
Introduction ,Objectives , Basic Concepts of C Language, Basic Constructs of Structured Programming, History of C Language, Advantages of C Language, Components of C Language, Structure of a C Program, A Sample C Language Program, Data Types, Primitive Data Types, Composite Data Types, Constants, Integer Constants ,Character Constants, Floating Point or Real Numbers, Enumeration Constant, String Constants, Logical Constants , Variables, Operators and Expressions, Arithmetic Operators, Increment and Decrement Operators, Logical Operators, Relational Operators, Conditional Operator, Assignment Operator, Bitwise Operators, Special Operators , Operators and Associativity, Type Modifiers, Type Definitions Using Typedf, Conditional Statements, SWITCH Statement, Control Program, Answers to 'Check Your Progress, Summary, Key Terms, Self-Assessment Questions and Exercises, Further Reading

### UNIT 2 ARRAYS, FUNCTIONS AND STRUCTURES, POINTERS
Introduction, Objectives, Arrays, Single-Dimensional Arrays , Multi-Dimensional Arrays , Two-dimensional Arrays, Three-dimensional Arrays,  String, Function Declaration and Prototype , Function Call – Passing Arguments to a Function , Function Definition, Need of User Defined Functions , Scope and Lifetime Declaration of Variables , Return Values , Storage Classes , Command Line Arguments, Recursion in Functions , Implementation of Euclid's gcd Algorithm,Structure Initailization , Declaration: Assigning Values to Members, Processing a Structure Variable , Comparison of Structure Variables, Array of Structures, Structure Elements passing to Functions, Structure Passing to Functions, Structure within Structure, Structure Containing Arrays, Union , Structure Pointers , Pointers: Declaration and Initialization, Pointer Notation and Accessing Variable, Arrays and Pointers , Pointer Expressions , Pointers and One Dimensional Arrays, Malloc Library Function and Calloc Library Function, Pointers and Multi-dimensional Arrays , Arrays of Pointers, Pointer to Pointers, Pointers and Functions , Function with a Variable number of Arguments, Answers to 'Check Your Progress', Summary,  Key Terms, Self-Assessment Questions and Exercises, Further Reading

### UNIT-3 DATA STRUCTURES
Introduction, Objectives, Data Structure, Primitive and Composite Data Types, Abstract Data Type, Algorithm Design, Program Analysis, Stacks and their Representation, Applications of Stacks , Simulating Recursive Function using Stack , Queues , Circular Queue , Deques , Priority Queue , Linked List , Static and Dynamic Memory Allocation, Static and Dynamic Variable, Linked Lists: Pointers , Singly Linked Lists. ,  Representation of Linked List, Implementation of Linked Lists , Reversing of Linked List , Concatenation of Linked List , Merging Linked List using Merge Sort , Applications of Linked List , Circular Linked List , Doubly Linked List , Generalized List , Answers to 'Check Your Progress' , Summary , Key Terms , Self-Assessment Questions and Exercises, Further Reading

### UNIT – 4 TREES AND GRAPHS
Introduction , Objectives, Trees: Basic Terminology , Binary Trees, Throrems Associated with Binary Trees, Tree Traversal, Implementation of Binary Trees , Deleting from a Binary Tree, Graph: Definition and Terminology, Representation of Graphs, Path Matrix, Traversal of Graph , Spanning Trees , Answers to 'Check Your Progress', Summary ,  Key Terms , Self-Assessment Questions and Exercises , Further Reading

### UNIT 5HASH TABLE, SEARCHING AND SORTING
Introduction, Objectives, Hash Table , Hashing Function ,  Terms Associated with Hash Tables Bucket Overflow, Handling Bucket Overflows , ISAM, Searching, Sorting , Answers to 'Check Your Progress', Summary, Key Terms, Self-Assessment Questions and Exercises, Further Reading

## BSCS0203: Basic of Data Science

# UNIT-1
Introduction, Toolboxes: Python, fundamental libraries for data Scientists,Integrated development environment (IDE). Data operations, Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.

# UNIT-2
Descriptive statistics, data preparation. Exploratory Data Analysis data summarization,data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates,hypothesis testing using confidence intervals, using p-values

# UNIT-3
Supervised Learning: First step, learning curves, training-validation and test.
Learning models generalities, support vector machines, random forest.
Examples

# UNIT-4
Regression analysis, Regression: linear regression simple linear regression,multiple & Polynomial regression, Sparse model. Unsupervised learning,clustering, similarity and distances, quality measures of clustering, case study.

# UNIT-5
Network Analysis, Graphs, Social Networks, centrality, drawing centrality of Graphs, PageRank, Ego-Networks, community Detection.

## BSCS0204:Computational Number Theory and Cryptography

Block-1
    Computational Complexity, GCD Computation, Finite Groups, Modular Arithmetic
Block-2
    Key Exchange, Public Key Cryptosystem, Factorization
Block-3
    Primality Testing, Elliptic Curve Cryptosystem, Hash Function Digital Signatures, Stream Ciphers
Block-4:
    Crypto-graphical Algorithms, Public Key Infrastructure, Classical cryptography

## B.Sc. IN CYBER SECURITY SEMESTER-III SYLLABUS

### BSCS0302:Operating Systems

**Unit-I**

Introduction: Definition, Design Goals, Evolution; Concept of User, job and Resources; Batch processing, Multi-programming, Time sharing; Structure and Functions of Operating System. Process Management: Process states, State Transitions, Process Control block, Context Switching, Process Scheduling, Scheduling algorithm, Threads.

**Unit-II**

Inter process synchronization and communication: need, Mutual exclusion, semaphore and hardware support for mutual exclusion, queuing implementation, and classical problem in concurrent programming, critical region and conditional critical region, Monitors, Messages, Deadlock

**Unit-III**

Management (Contiguous and non contiguous) : Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing, Working Set Model, Paging.

**Unit- IV**

File : File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, Allocation Methods, Free Space management; Secondary.

**Unit-V**

Storage Management: Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management. Protection & Security. System Software: Definition, their types, Loader, linker, editor, Assembler, Compiler, Interpreter.

**References:**

1. Silberschatz and Galvin, Operating System Concepts, Addison Wesley6/ed.
2. Modern operating Systems, A S Tanenbaum, , PHI.
3. Operating System Concepts, Peterson and Silberschatz, ,     Addison Wesley.
4. Operating Systems: Internals and Design Principles , William Stalling,     PHI.
5. System Software ,Dhamdhare, , TMH.

# BSCS0303: Computer Networks

## Unit-I

Introduction: Goal and application Network Hardware and Software , Protocol hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Reference Model ,Types of computer Network :LAN,MAN,WAN, Topologies, Transmission mode .Physical Layer: Transmission Media ,Concept of data transmission ,Switching Techniques ,Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM. Digital Modulation and Demodulation Techniques

## Unit-II

Data Link Layer: Data Link Layer design issues, Framing, Flow control, Error Detection and Correction DLL Protocol: Stop and Wait Protocol, Sliding window protocol, A Simplex

protocol for noisy channel, Medium access sublayer: Channel allocation –static and dynamic ,Multiple access protocol FDDI, Data Link Layer in the Internet – SLIP,PPP.

## Unit-III

Network Layer: The Network Layer Design Issue, comparison of virtual circuits and datagram subnets, connectionless internetworking, Tunnelling, Internetwork routing, Routing algorithm , Fragmentation, The Network Layer in the Internet – The IP Protocol, IP Address, subnets, Internet control protocols, internet multicasting.

## Unit-IV

Transport Layer: The Transport layer services, The concept of client and server in terms of socket addressing Quality, of service, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP.

## Unit-V

Presentation and Application Layer: Network Security – Traditional Cryptography, Two fundamental Cryptographic Principles, Secret Key Algorithms Public key Algorithms, Authentication protocols, DNS,E-mail.

## References:

1. Computer Networks ,A.S. Tanenbaum, Pearson Education
2. Data Communications and Networking ,Forouzan, Tata McGraw Hill Company
3. Computer Network , S.S.Shinde ,New Age International Publisher.
4. Data and computer Communication , Shashi banzal ,Firewall media
5. Data & Computer communication, William Stallings, Pearson

## BSCS0304: Application and Network Security

**UNIT-I:**

Introduction, Security Concepts, Threats and Risks, Attacks – Passive andActive, Security Services, Confidentiality, Authentication, Non-Repudiation,Integrity, Access Control, Availability.

**UNIT-II:**

Access Control Models, Bell-LaPadula, Non- Interference and Role Base Model. Cryptography, Secret Key and Public Key Cryptosystems, Symmetric Ciphers, Block Ciphers and Stream Ciphers, DES,Triple DES, RSA.

**UNIT-III:**

Secure Hash and Key management, Digital Signature and Non-repudiation, cryptanalysis. Network Security, Objectives and Architectures, Internet Security Protocols, IP encapsulating Security Protocol, Network and Transport Layer Security

**UNIT-IV:**

Network Security Applications, Authentication Mechanisms: a) Passwords, b) Cryptographic authentication protocol, c) Smart Card, d) Biometrics,e) Digital Signatures and seals, f) Kerberos, g) X.509 LDAP Directory. Web Security :SSL

**UNIT-V:**

E-mail Security, PGPs / MIME, IP Security, Access and System Security ,Intruders, Intrusion Detection and Prevention , Firewall a) Hardware Firewall b) Software Firewall c) Application Firewall d) Packet Filtering. e). Packet Analysis , Proxy Servers, Firewall setting in Proxy, ACL in Proxy

**References :**
1. Network Security Essentials ,William Stallings,  Prentice-Hall.
2. Fundamentals of Computer Security Technology, Edward Amoroso, Prentice-Hall.
3. Cryptography and Data Security ,Dorothy E. Denning,  Addison-Wesley.
4. Computers under Attack ,Peter J. Denning,  Addison-Wesley.
5. Cryptography: Theory and Practice ,Douglas R. Stinson, CRC Press.

## B.Sc. IN CYBER SECURITY SEMESTER-IV SYLLABUS

## BSCS0404: Artificial Intelligence

### Unit-I

Introduction, AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, and problem formulation.

### Unit-II

Searching for solutions, uniformed search strategies – Breadth first search, depth first search, Depth limited search, Iterative-deepening depth first search bi-direction search - comparison. Search with partial information (Heuristic search) Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions. Local search Algorithms: Hill climbing, simulated, annealing search, local beam search, genetical algorithms. Constrain satisfaction problems: Backtracking search for CSPs local search for constraint satisfaction problems.

### Unit-III

Game Playing: Adversial search, Games, minimax, algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Evaluation functions, cutting of search., Knowledge representation Reasoning and Agents :knowledge – Based Agents, the Wumpus world, logic, propositional logic, Resolution patterns in propos ional logic, Resolution, Forward & Backward. Chaining. First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution.

### Unit-IV

Planning: Classical planning problem, Language of planning problems, Expressiveness and extension, planning with state – space search, Forward states spare search, Backward states space search, Heuristics for stats  space search. Planning search, planning with state space search, partial order planning Graphs.

### Unit-V
**Learning :Forms of learning, Induction learning, Learning Decision Tree, Statistical learning methods, learning with complex data, learning with Hidden variables – The EM Algorithm, Instance Based learning, Neural Networks.**

**Refrences :**
1. Introduction to Artificial Intelligence – Rajendra Akerkar, PHI.
2. Artificial Intelligence – A Modern Approach. Second Edition, Stuart Russel, Peter Norvig, PHI/Pearson Education.
3. Artificial Intelligence, 3rd Edition, Patrick Henry Winston.,  Pearson Edition,
4. Artificial Intelligence and Expert Systems – Patterson PHI
5. Expert Systems: Principles and Programming- Fourth Edn, Giarrantana/ Riley, Thomson

# B.Sc. IN CYBER SECURITY SEMESTER-V SYLLABUS

## BSCS0501: Software Engineering

**Unit-I**

Software Engineering Fundamentals: Software Engineering, Software Product: Software development paradigms, software Characteristics and Application. Software Development life cycle, water fall model, Prototyping, Incremental & Spiral model, 4th Generation Techniques. Project Management: Concepts, Software Process and Project Metrics; Software Measurements; Software Projects Planning: Objectives, Scope and Resources. Empirical Estimation Models: COCOMO Model, Software Equation, Project Scheduling and Tracking.

**Unit-II**

Software Requirement System(SRS) and Analysis: System Engineering, Product Engineering: Characteristics of a Good SRS, Requirement analysis, Principal, Software prototyping. Analysis modelling: data modelling, mechanics for structured analysis, system analysis tools and techniques, DFD, ER- Diagrams. Data Dictionary (DD), System Design: Design concept and principles and its elements, effective modular design, Cohesion & Coupling, Feature of modern graphics interface (GUI). Design Methods: data design, interface design guidelines, procedural design.

**Unit-III**

Software Quality Assurance(SQA): Quality and factors, Quality Assurance, Software Quality Metrics, Process and Product Quality, Capability Maturity Model (CMM). Software Quality Assurance(SQA), Need for SQA, SQA Activities, Building blocks of SQA, SQA Planning & Standards, Software Reliability, Reliability Measures. Introduction to Software Testing: Need of software(s/w) testing, Error, fault and failure. s/w Testing fundamentals, Testing objectives, test information flows, Testing lifecycle, Test Cases.

**Unit-IV**

Levels of Testing**:** Unit Testing, Integration Testing, System Testing, Acceptance Testing, Alpha testing & Beta testing, Static vs. Dynamic testing, Manual vs. Automatic testing, Different types of Testing: Installation Testing, Usability testing, Regression testing, Performance testing, Load testing, stress testing, Security testing, Static & Dynamic testing, Static testing techniques, Review types : Informal Review, Technical or peer review, Walkthrough, Inspection, static analysis, Review meeting and reporting , Review guidelines & Review checklist, Data flow analysis, Control flow analysis, Cyclometric Analysis, Dynamic testing – need & Advantages

**Unit-V**

Black Box & White Box Testing (Test Case Design Techniques):Functional Testing (Black Box), Equivalence partitioning, BVA, Decision table based testing, Cause-Effect graphing, Syntax testing (Concept & Test case generation only), Structural Testing (White Box), Coverage testing, Statement coverage, Branch & decision coverage, Path coverage, Validation testing Activities, Low level testing, High level testing, Black box Vs. White Box

**References:**

1. Software Engineering – A Practitioners Approach Roger S. Pressman, Mcgraw Hill, International Education.
2. An Integrated Approach To software Engineering, Pankaj Jolote, ,Narosa
3. Software Engineering – A Programming Approach, D. Belie I. Moray, J. Rough, PHI.
4. Software Testing Techniques, Barrios Bier, Van N Ostrand Reinhold.
5. Software Engineering Concepts-Richard Fairley, CDAC. Tata McGraw-Hill Series.

## BSCS0504:Cloud Computing

**Unit 1: Infrastructure as a Service& Platform as a Service**
Learning Objective, Cloud Service Models, Infrastructure as a Service, Platform as a Service, Case Studies, Let's Sum up

**Unit 2:Software as a Service and Database as a Service**
Learning Objectives, Software as a Service (SaaS),  Database as a Service (DBaaS), Let's Sum up

**Unit 3:Security as a Service**
Learning Objectives, Introduction to Security as a Service, Cloud Security Risk analysis,  SECaaS Categories, Benefits Of Security As A Service, Evaluation of Cloud Security Issues, Cloud Security Standards, Let's sum up

**Unit 4:Specialized Cloud Services**
Learning Objectives, Recovery as a Service (RaaS), Identity as a Service (IDaaS), Storage as a Service, Communication as a Service (CaaS), Let's sum up

### BSCS0601: Deep Learning

**Unit-1**

Definition of Machine Learning, Fundamentals of ANN, The Biological Neuron, Artificial neuron model, Basic Elements of ANN, Different Learning Rules, Requirements of Learning Laws, Supervised learning, Unsupervised learning, Reinforced learning, Hebbian learning, Gradient descent learning, Perceptron Model, Simple Perceptron for Pattern Classification, Perceptron Algorithm, Limitations of single layer perceptrons, Multi-Layer Perceptron Model, Multi Layer Perceptron Algorithm, linearly seperable & Linear in separable tasks, Convex Region, Types of convex regions, Logistic Regression, Support Vector Machines, SVM can be of two types, Linear SVM, Gradient Descent, Types of Gradient Descent, Stochastic Gradient Descent,

**Unit-2**

History of Deep Learning, A Probabilistic Theory of Deep Learning, Back Propagation Networks (BPN), Need for Multilayer Networks , Multi-Layer Networks, Back Propagation Networks (BPN), BPN Algorithm, Merits, Demerits, Regularization, Difference between L1 & L2 Parameter Regularization, Batch Normalization, Procedure to do Batch Normalization, Shallow Networks, Difference Between a Shallow Net & Deep Learning Net,

**Unit- 3**

**Linear Factor Models, Dimensionality Reduction, Principal Component Analysis (PCA), Computing the Principal Components, Steps involved in PCA, PCA Advantages, Disadvantages of PCA, Linear Discrimination Analysis (LDA), Need for LDA, Limitations, Steps involved in LDA, Pros & Cons of LDA, Manifold Learnings, Auto Encoders, Types of AutoEncoders are, Hyperparameters of an AutoEncoder, Hyperparameter Optimization,          Hyperparameter Optimization methods**

**Unit -4 DIMENTIONALITY REDUCTION**

**, Optimization in Deep Learning, Need for Optimization, Convex Optimization, Non-Convex Optimization, How to solve non-convex problems, Reasons For Non-Convexity, Spatial Transform Network [STN], Advantages, Recurrent Neural Networks, Need for RNN, Providing Input to RNN, providing Targets to RNN, Long Short Term Memory Network's ( LSTM), Steps Involved in LSTM Networks, Applications of LSTM include, Computational and Artificial Neuro-Science, The Biological Neurons, Artificial neuron model, Basic Elements of ANN, Applications of Computational Neuro Science,**

**UNIT V APPLICATIONS OF DEEP LEARNING**

Imagenet, Technical details of Image Net, How the images are labelled in ImageNet?, How the images of ImageNet Licensed?, Shortcomings of ImageNet, WaveNet, The Workflow of WaveNet, Natural Language Processing [NLP], Natural Language Processing Phases, Morphological Processing, Syntax Analysis, Semantic Analysis, Pragmatic Analysis, Different types based on Working, Applications of NLP, Word2Vec: Applications of Deep Learning Networks, Joint Detection, Steps Involved, Other Applications,

## BSCS0602: Computer Graphics

**UNIT -I**

Overview of Graphics Systems: Video Display Devices , Refresh cathode ray tubes, Refresh scan displays, Random scan displays, color CRT Monitors, DVST, Flat- Panel displays, Three Dimensional viewing devices, Raster scan systems, Input Devices: Keyboards, Mouse, Track ball, Joysticks, Data Glove, Touch Panels, Light pens.

**UNIT –II**

Curves and Surfaces:Line Drawing Algorithm, DDA Algorithm, Bresenham's Line Drawing Algorithm, Bresenham's Circle Drawing Algorithm, Ellipse Drawing Algorithm, Pixel Addressing and object geometry: Screen Grid coordinates, Maintaning Goemetry properties of Displayed objects.

**UNIT –III**

Geometric Transformation:Homogeneous Coordinate System for 2D and 3D, Various 2D, 3D Transformation matrices (Translation, Scaling, Rotation, Shear), Rotation about an arbitrary point (2D), Rotation about an arbitrary axis (3D), Computing location of V.P, Clipping Algorithms, Sutherland-Cohen Clipping Algorithm.

**UNIT-IV**

Curves and Visible Surface Detection Methods: Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials, B-Spline Curves, Computing control points given end slopes for a specified curve segment. Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method, Scan Line Method, Depth Sorting Method, Area Subdivision Method.

**UNIT –V**

Illumination Model and Surface Rendering: Basic Illumination models, shading models for curve surfaces, Half tone Pattern and Dithering Techniques, Rendering, Color Models: XYZ Color Model, RGB, YIQ, CMY, HSV, HLS.

**References:**

1. Computer Graphics, D. Hearn and P. Baker, Prentice Hall.
2. Computer Graphics, R. Plastock and Z.Xiang, Schaum's Series, McGraw Hill.
3. Computer Graphics Principles & Practice, Foley et. al., Addison Wesley.
4. Procedural Elements for Computer Graphics, David F. Rogers, McGraw Hill.
5. Principles of Interactive Computer Graphics, W. Newman and R. Sproul, McGraw-Hill.