PROGRAM STRUCTURE AND SYLLABUS

As Per

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (LOCF) AND NATIONAL EDUCATION POLICY(NEP-2020)

FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

Degree Program

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2022-2023 ONWARDS

FACULTY OF COMPUTATIONAL SCIENCES

GNA UNIVERSITY
SRI HARGOBINDGARH, PHAGWARA – HOSHIARPUR ROAD, PHAGWARA-144401, PUNJAB
INDIA

ORDINANCE

FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

(THIS ORDINANCE HAS BEEN APPROVED IN THE MEETING OF BOARD OF MANAGEMENT HELD ON DATED 15June 2022)

APPLICABLE W.E.F. ACADEMIC SESSION 2022-23

SRI HARGOBINDGARH, PHAGWARA – HOSHIARPUR ROAD, PHAGWARA 144401

PUNJAB

ORDINANCE FOR

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

SHORT TITLE AND COMMENCEMENT

I. This ordinance shall be called the ordinance for the B.Sc. (IT) of GNA University, Phagwara.

II. This ordinance shall come into force with effect from academic session 2022-23.

1. **Name of Program: Bachelor of Science (Information Technology).**
2. **Name of Faculty: Faculty of Computational Science.**
3. **Vision of the department:** To develop the skilled computer and IT professionals meeting global requirements of IT industry.
4. **Mission of the department:**
   - **M1:** To provide state of art infrastructure and conducive environment for budding IT professionals.
   - **M2:** To establish strong industry academia relationship to enhance the technical skills of the students and make them readily employable.
   - **M3:** To provide exposure to the emerging and establish tools and technology in the field of computer applications.
   - **M4:** To develop curriculum in accordance with the industry requirements.
5. **Program Educational Outcomes (PEO):**
   - **PEO1:** To excel in software development skills coveted in the IT industry.
   - **PEO2:** To produce graduates who will be effective in multidisciplinary and diverse IT environment.
   - **PEO3:** To involve student in lifelong learning to adapt the technological advancements in the emerging areas of computer applications.
   - **PEO4:** To provide student with an academic environment that fosters excellence, transparency, leadership and promote awareness of life-long learning.
   - **PEO5:** To become an entrepreneur who can provide solutions and develop software products for Enterprise needs.
   - **PEO6:** To Work as teams to build software systems and apply the technologies in various fields of Computer Applications, including hardware problems, Website development and management, databases, and software engineering techniques.
   - **PEO7:** To produce computer science graduates who will be used as feeder candidates for higher studies in the field of Information Technology and Computer Applications.
6. **Program Specific Outcomes:**
   - **PSO1**: Understand the basic concepts of computer programming fundamentals, OOP concepts, Databases, Computer system architecture, web applications and, hardware related applications.
   - **PSO2:** Understand Identify the fundamental concepts in mobile application development.

- **PSO3** Demonstrate understanding of various programming paradigms in the field of Information Technology.
- **PSO4** Formulate software development terminology into real life systems.
- **PSO5** Develop proficiency in the practice of computing.

7. Program Outcome (PO):

- **PO1: Domain Expertise:** Apply knowledge of computing and mathematics appropriate to the discipline.
- **PO2: Computing Skills and Ethics:** Analyze a problem and identify and define the computing requirements appropriate to its solution.
- **PO3: Lifelong Learning:** Work as teams to build software systems and apply the technologies in various fields of Computer Technology, including hardware problems, Web site development and management, databases, and software engineering techniques.
- **PO4: Modern Tool Usage:** Use current techniques, skills, and tools necessary for computing practices.
- **PO5: Social Contribution:** Follow professional software engineering practice by applying contextual knowledge to assess societal and legal issues.
- **PO6: Ethics:** Recognize the social and ethical responsibilities of a professional working in the discipline.

Additional Program Outcomes: B.Sc. (IT) degree (Hons.)

The Bachelor of Information Technology (BSc IT) program enables students to attain following addition attributes besides the afore-mentioned attributes, by the time of graduation:

- **PO1:** To develop the ability to analyze a problem and devise an algorithm to solve it.
- **PO2:** To pursue quality research of the latest areas of IT fields.
- **PO3:** An ability to independently carry out research / investigation and development work to solve practical problems.

8. General Regulation for Faculty of Computational Science:

- The University may introduce programs under Faculty of Computational Science which are specified under the UGC Act 1956. The Governing Body may approve the introduction, suspending or phasing out a program on the recommendation of the Academic Council either on its own or on the initiative of faculty.
- The admissions to a Faculty of Computational Science programs shall be generally governed by the rules of the UGC or any other competent authority of the MHRD or as approved by Governing Body of University and shall be as notified in the admission notification of the respective academic year.
- The minimum entry qualification for admission to the students of Faculty of Computational Science shall be such as may be laid down in the regulations or specified by the Governing Body like Minimum qualification for admission to the first-year program of Faculty of Computational Science shall be the Senior Secondary School Certificate (10+2) examination. While deciding the admission procedure, the University may lay down compulsory subjects in qualifying examination for admission for various programs in the admission policy.
- A student shall be required to earn a minimum number of credits through various academic components of a curriculum, as provided for in the regulations.
- A student shall be required to complete all the requirements for the award of the degree within such period as may be specified in the regulations.

- A student may be granted such scholarship as may be specified in accordance with the directions of the Governing Body from time to time or regulations laid down for the same.
- A student admitted to the programs shall be governed by the rules, regulations and procedures framed and implemented by the University from time to time.
- The students shall abide by the regulations mentioned in student handbook issued by the University. These standing regulations shall deal with the discipline of the students in the Hostels, Faculty, and University premises or outside. The standing orders may also deal with such other matters as are considered necessary for the general conduct of the students' co-curricular and extra-curricular activities.
- In exceptional circumstances the chairman of Academic Council may, on behalf of the Council, approve amendments, modifications, Insertions or deletions of an Ordinance(s) which in his/her opinion is necessary or expedient for the smooth running of the program: provided all such changes are reported to the Council in its next meeting.

9. General Regulations for the B.Sc. (IT)Programs:

- **Short Title and Commencement:** These regulations shall be called regulations for the UG programs in Faculty of Computational Science of the University and shall come into force on such a date as the Academic Council may approve.
- **Duration:** The undergraduate degree should be three or four-year, with multiple entries and exit options within this period. The duration of the UG programs leading to degrees of B.Sc. (IT) shall extend over four academic years (Eight Semesters) with multiple entries and exit options. The students can exit after the completion of one academic year (Two semesters) with the Certificate in Information Technology; Diploma in Information Technology after the study of Two academic years (Four Semesters); and Regular Bachelor Degree after the completion of Three academic years (Six Semesters). The successful completion of Four Years undergraduate Programmed would lead to Bachelor Degrees with Honours in Information Technology. Each year will comprise of two semesters. The duration may be extended up-to two years for certificate in Information Technology from the registered batch. The duration may be extended up-to four years for Diploma in Information Technology from the registered batch. The duration may be extended up-to five years for Bachelor in Information Technology from the registered batch. The duration may be extended up-to seven years for Bachelor in Information Technology (Hons.) from the registered batch. The maximum duration of the programs excludes the period of withdrawal, due to medical reasons. However, it shall include the period of suspension or any other reason of discipline /academics e.g. detention, willful absence by the student, not getting promotion to the next class due to poor academic performance etc. Under detention, the student shall attend the University for an additional semester or more time, as equated to period of absence/suspension.
- **Starting or Phasing out of Program:** The University may offer such Undergraduate programs in Computational Science leading to award the Certificate in Information Technology/Diploma in Information Technology/ degree in Bachelor of Science (Information Technology)/ honours degree in Bachelor of Science (Information Technology), as per nomenclature laid by the NEP/UGC regulations on the subject. A program may be phased out on recommendations of the Academic Council and approval of the Governing Body, on account of continuous low registration in the program or any other justifiable reason like becoming obsolete etc. Similarly, the Academic Council may approve starting of a new

Program or modifying the existing one on the recommendations of the Academic Council.

- **Admissions:** Admission to B.Sc. (IT) program shall be made as per procedure approved by the Governing Body and may be reviewed periodically as required. Fee structure, refund policy, total number of seats, reservation policy, or direct entry into II year through lateral entry scheme etc. shall be defined in the admission policy.
- **Eligibility for Admission:** All those candidates who have the 10+2 or equivalent examination in any stream with 50% (45 % for SC/ST/OBC) marks in aggregate from any recognized board/ Council.

OR

B.SC.(IT) (Lateral Entry): It is a Under Graduate (UG) Programme of 2 or 3-years duration (4 or6 semesters). Eligibility: All those candidates who have passed Matriculation examination and have also passed 3 Year Diploma in any Trade from Punjab State Board of Technical Education & Industrial Training, Chandigarh or such Examination from any other recognized State Board of Technical Education, or Sant Longowal Institute of Engineering & Technology, Longowal.

OR

10+2 with 1-year Certificate/Diploma in Computer Application / IT (or equivalent) from a recognized University with Mathematics as course at 10+2 or DIT / DCA level.

- **Semester System:** The B.Sc. (IT) academic programs in the University shall be based on Semester System; namely, Even (Jan to June) and Odd (July to Dec) Semesters, in an academic year. The courses whether offered in regular semester shall be evaluated as per the policy and procedure laid down.
- **Semester Duration:** A semester will be of approximately 18-20 weeks duration. Of these, 90 days will be available for actual instructions including Mid Semester Exam.

10. Curriculum: The 4 years curriculum has been divided into six semesters and shall include lectures/ tutorials/ laboratory work/project work/ viva/ seminars/presentations/ Industry Training/ assignments/Industry Visits. The curriculum will also include other curricular, co-curricular and extra-curricular activities as may be prescribed by the university from time to time.

11. Choice Based Credit System:

The University has adopted Choice Based Credit System (CBCS), which provides an opportunity to the students to choose courses from the offered courses comprising of Core, Elective, Ability Enhancement and Audit Courses. The choice-based credit system provides a "flexible" approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

12. Courses:

Outcome Based Education (OBE): OBE is a student-centric teaching and learning methodology in which the course delivery, assessment is planned to achieve, stated objectives and outcomes. It focuses on measuring student performance i.e. outcomes at different levels.

I. **Discipline Core Course (DCC):** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

II. **Elective Course:** Generally, a course which can be chosen from a pool of courses and which may be very

specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope, or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

i. **Discipline Specific Elective (DSE) Course**: Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

DSE: Twenty-four courses are offered, in semester V and VI and four courses in each bucket.

ii. **Vocational Courses (VC) Course**: Vocational course is a course that enables individual to acquire skills set that are required for a particular job.

VC: Two VC Courses are offered each in semesters.

Note: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Vocational Courses.

III. **Foundation Course:** The Foundation Courses may be of two kinds: Compulsory Foundation and Elective foundation. "Compulsory Foundation" courses are the courses based upon the content that leads to Knowledge enhancement. They are mandatory for all disciplines.

IV. **Ability Enhancement Courses (AEC):** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; i. Environmental Science and ii. English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

i. Ability Enhancement Compulsory Courses (AECC): Environmental Science, English Communication/MIL Communication.

ii. Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

V. **Project Work:** It is considered as a special course involving application of knowledge in solving/analysing/exploring a real-life situation/difficult problem. A candidate study such as a course on his own with an advisory support by a teacher/faculty member. The work dine will have to submitted in writing.

VI. **Industrial Internship/ Training**: Students must complete **Industrial Internship/ Training** during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. The internship/Training will be evaluated in the fifth semester.

VII. **Research Project:** It is considered as a special course involving the application of knowledge in solving/analysing/exploring a real-life situations and difficult problem for a bachelor degree with honours/research.

13. Medium of Instructions:

11.1 The medium of instructions and examination will be English.

11.2 Practical work/Project Work / Project Report/ Training Report etc., if any, should be presented in English.

14. **Mode:** The program is offered in 'Full Time' mode of study only.

15. **Attendance Requirement to be Eligible to Appear in End Semester Examination:**

- Every student is required to attend at least 75% of the lectures delivered squaring tutorials, practical and other prescribed curricular and co-curricular activities.
- Dean of Faculty may give a further relaxation of attendance up to 5% to a student provided that he/she has been absent with prior permission of the Dean of the Faculty for the reasons acceptable to him/her.
- Further, relaxation up to 10% may be given by the Vice Chancellor to make a student eligible under special circumstances only.
- No student will be allowed to appear in the end semester examination if he/she does not satisfy the attendance requirements. Further, the attendance shall be counted from the date of admission in the University or commencement of academic session whichever is later.
- Attendance of N.C.C/N.S.S. Camps or Inter collegiate or Inter University or Inter State or International matches or debates or Educational Excursion or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not to be counted as absence. However, such absence shall not exceed four weeks per semester of the total period of instructions. Such facility should not be availed twice during the course of study

16. **Credit:** Each course, except a few special audit courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and/or laboratory contact hours in a week.

A letter grade, corresponding to specified number of grade points, is awarded in each course for which a student is registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average. A minimum number of credits should be acquired to qualify for the programs. The absolute grading system has been followed for awarding grades in a course.

Earned Credits (EC): The credits assigned to a course in which a student has obtained 'D' (minimum passing grade) or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained F, or W or "I" grade will not be counted towards his/her earned credits.

A unit by which the course is measured. It determines the number of hours of instruction required per week.

Contact Hours per Week	**Credit Assigned**
1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
2 Hours Practical (Lab) per week	1 credit

16.1 Acceptance of MOOC courses

Faculty of Faculty of Computational Science accepts the MOOC course available on SWAYAM platform for credit transfer. 40% of the courses can be taken from the available list of MOOCs on SWAYAM.

Instructions for MOOC courses

a) MOOC courses taken for credit transfer must be approved and recommended by Dean Academics and Dean of the Faculty before the start of the semester.
b) The copy of the list of courses taken by the students for any course has to be submitted to the Controller of the Examination.
c) MOOC course should be done from SWAYAM platform as per the guidelines of UGC.

d) To obtain the credit the student needs to complete the assessment of the course and provide the certificate of the course issued by the SWAYAM/NPTEL. After completing the certificate, the student must submit the certificate within a week to the department.
e) The fees (if any) for the registration and / or assessment of the MOOC course must be borne by the student only.
f) The student can opt for a particular online MOOC course if and only if the credit of that course is equivalently mapped with the program structure.
g) If the student obtains the same course credit which mapped with the course, then credit shall be considered for this course and the grade/marks provided by the accessing authority shall be transfer to the student. The result of the MOOC shall be taken on record by the university examination cell and a result declared for these papers.
h) For any particular semester, all results for the MOOC course must be submitted along with the marks of other papers of the same semester by the course coordinator.
i) MOOC course coordinators shall be appointed for each of the course taken by the student.

17. Program Structure: BSc IT

MODEL FOUND APPROPRIATE AND ADOPTED
Program Structures for the Under-Graduate Program (Bachelor of Science (Information Technology))

Bachelor of Computer Applications	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective (DSE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC), (Credits) (L+T+P)	Vocational Courses (VC), (Credits) (L+T+P)	Skill Enhancement Courses (SEC) (L+T+P)	Projects (L+T+P) /Industrial Training	Total Credits
Semester 1	DSC-1 papers (6) (3+1+4), DSC-1 papers (5) (4+0+2), DSC-1 papers (4) (3+1+0)		AECC-1 papers (3) (2+0+2), AECC-1 papers (2) (2+0+0)	VC-1 papers (3) (3+0+0)			23
Semester 2	DSC-1 papers (6) (3+1+4), DSC-2 papers (4) (3+0+2), DSC-1 papers (3) (3+0+0)		AECC-1 papers (3) (2+0+2), AECC-1 papers (2) (2+0+0)	VC-1 papers (3) (3+0+0)			25
Exit option with Certificate (47 credits); Certificate in Information Technology							
Semester 3	DSC-1 papers (6) (3+1+4), DSC-1 papers (5) (3+1+2), DSC-1 papers (4) (3+0+2), DSC-1 papers (3) (3+0+0)			VC-1 papers (3) (3+0+0)	SEC-1 papers (3) (2+0+2)		24
Semester 4	DSC-1 papers (4) (4+0+0), DSC-2 papers (6) (3+1+4)		AECC-1 papers (2) (2+0+0)	VC-1 papers (3) (3+0+0)	SEC-1 papers (4) (3+0+2)		25
Exit option with Diploma (96 credits); Diploma in Information Technology							
Semester 5		DSC-3 papers (6) (3+1+4)			SEC-1 papers (3) (2+0+2)	Minor Project (1) (0+0+2), Industrial Training (2)	24
Semester 6		DSE-2 papers (6) (3+1+4), DSE-1 papers (5) (3+1+2)			SEC-1 papers (3) (2+0+2)	Major Project (2) (0+0+4)	21
Exit option with Bachelors (141 credits); Bachelors in Science (Information Technology)							
Semester 7	DSC-2 papers (6) (3+1+4), DSC-1 papers (6) (4+0+4), DSC-1 papers (4) (3+1+0)						22
Semester 8	DSC-1 papers (6) (3+1+4), DSC-2 papers (4) (3+1+0), DSC-1 papers (3) (3+0+3)					Research Project (4) (0+0+8)	21
Award of Bachelor (Hons.) (184 credits); Bachelors in Science (Information Technology) (Hons.)							

18. Industrial Training:

- Industrial training is a core course, to be done typically during the summer vacations. A student should undergo industrial training for 4-6 weeks, starting after year 2, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Training of 4th semester shall be graded and essential part of the degree requirement in 5th semester.
- It is the responsibility of the Corporate Relations Department (CRD) to arrange for training for all the students. In the beginning of each academic session, Corporate Relations Department will prepare a program wise list of potential training organizations. These organizations will be approached by the Corporate Relations Department with a request to provide training seats. Consolidated lists of training offers will be made available to the eligible students in the beginning of even semester of the session. If a student is interested in making his/her own arrangement for the training seat, he/she will need to have the training organization approved by routing the application to the Dean of Faculty of Computational Science for approval.
- The students will be required to get their training activity and results reviewed by organization in which they have attended the training. Each Faculty shall nominate training coordinator from amongst the faculty members. The faculty will scrutinize the training report and the certificate issued by the corporate and will award a satisfactory/unsatisfactory grade, which must be sent to the controller of examination office within one month of commencement of next semester. In case the training is considered to be unsatisfactory, an Unsatisfactory' grade will be awarded and the student shall have to undergo fresh industrial training in part or full duration as decided by the Dean of Faculty of Computational Science. The industrial training, submission of training report and obtaining satisfactory grade is mandatory requirement for award of B.Sc. (IT) degree/ B.Sc. (IT) degree (Hons.).
- **Minor Project:** A project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students at the University. The project may take a wide variety of forms, but they shall be semester-long investigative projects that culminate in a final product, presentation, or performance.
- **Major Project:** A major project shall be a multifaceted assignment that serves as a culminating academic and intellectual experience for students at the University. Major projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a f student is required to do some innovative work with application of knowledge earned while undergoing various courses and labs in the earlier years. The student is expected to do literature survey and carry out development and/or experimentation. Through the project work the student must exhibit both the analytical and practical skills. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.
- **Research Project:** A design to acquire special/advanced knowledge such as supplement study/support study to a project work and a student course independently with an advisory support by a teacher/faculty member is called research project. It is considered as a special course involving the application of knowledge in solving/analyzing/exploring a real-life situations and difficult problem for a bachelor

degree with honors/research. Research projects may take a wide variety of forms, but they shall be Semester long investigative projects that culminate in a final product, presentation, or performance. In projects under the guidance of a faculty member, a student is required to do some innovative research work. The student is expected to do literature survey and carry out development and/or experimentation. The student will have to do his/her project under the guidance of the faculty member from the same department unless specifically permitted by the Head of the Department for alternate arrangements.

19. Examination/Evaluation System: The evaluation system of the University shall be oriented to encourage the academic qualities. The University follows two components to evaluate student's performance:

- **Internal Assessment:** It includes components such as Attendance, Mid-Semester Examination, Assignments, and Continuous Assessment Test carrying a weightage of 40%. This is applicable to all theory courses.
- **Laboratory Courses:** The examination/evaluation criteria of the practical courses shall be decided by the respective faculty member and wherever required on the availability of the external experts/visiting faculty. Faculty may set/design the practical exercises out of any marks, but the overall weightage shall be in pre-defined percentage, which the concerned faculty/course coordinator shall announce in the first class of the semester and upload on the GU-MS. Methodology for evaluation of Lab component may include day to day work, lab records, quantity/quality of work and Viva-voce/Seminar/Practical as may be decided.
- **Laboratory Internal Assessment:** It includes components Lab Evaluation, Internal viva, Attendance and Practical File/Report Submission carrying a weightage of 60%. The internal marks of special courses like Project, summer industry training, and six-month industry training has been predefined.
- **External Assessment:**
  a) **End Semester Examination:** These examinations shall be conducted by Controller of Examination. The examination dates and schedule shall be released by the University.
  b) End Semester Examination, carrying a weightage of 60%.
  c) The external marks of special courses like Project, summer industry training, and six-month industry training has been predefined.
  d) External Lab Assessment which includes components (Demonstration/Written Practical Examination, External Lab Viva-Voce) carrying a weightage of 40 %.
  e) Every student has to score at least 25% marks each in Continuous Assessment and End Semester Examination. The minimum pass percentage is 40% in aggregate. In case a student scores more than 25% each in Continuous Assessment and End Semester Examination, but the overall percentage in the concerned subject remains less than 40%, then a student has to repeat End Semester Examination in that subject.
- **Failing to meet Attendance Requirement:**
  a) A student is required to attend all the classes.
  b) If the attendance profile of a student is unsatisfactory, he/she will be debarred. Any student, who has been debarred due to attendance shortage, shall not be allowed to take the supplementary

Examination. The student shall have to register for the course in the regular semester when offered.

- **Make Up Examinations for Mid Semester Examination:** A student may apply for a makeup examination where he/she is not able to attend the examination schedule due to reasons of personal medical condition or compassionate reason like death of a very close relative. No other contingencies are acceptable. Except in case of medical emergency, a student needs to seek advance approval from appropriate authority before missing the Examination.

Theory Courses:

- A student missing Mid Term Examination only shall be required to take a make-up Examination.
- The students must put-up the request for make-up Examination along with the medical documents to prove the genuineness of the case (for having missed the Examination) within 5 days of last date of Examination.
- The genuineness shall be reviewed and approved by the Vice Chancellor, whose decision shall be final.
- In case a student misses the make-up Examination also, then no further chance will be provided.
- The duration of Examination shall be as decided by the Faculty member.
- Genuine approved cases shall be notified by the Controller of Examination based on the requests received and only such students shall be allowed to take make-up Examination in the subjects where approval has been granted.
- The date sheet need not be taken out as the makeup examination shall be conducted under arrangement concerned faculty, who after evaluation and sharing the evaluated answer sheet with student shall submit marks to the Controller of Examination.

- **Makeup of End Semester Examination:** It is mandatory to appear the end semester major examination to obtain any grade for a course. A student who misses the end semester major examination shall follow a similar procedure as outlined above, to obtain approval of the Vice Chancellor to prove genuineness of the case. The student whose case is approved as genuine shall be awarded "I" Grade in the semester results in the given subject. The student shall be allowed to appear in the supplementary examination of the said subject. However, the grades shall be worked out by computing the marks obtained by students in Mid Term Exams, TA, Lab and supplementary examination (equated to the weightage of end semester examination). The total marks shall be compared with the marks of the class as in the regular semester for award of grade.
- **Makeup of End Semester Viva of Projects:** It is mandatory to appear in the final Viva examination to obtain any grade for a project course. In case of student missing the same for genuine reasons; similar method as given for written examination of theory courses shall be followed.
- **Procedure to be adopted by students in case of missing any of the specified Examination(s):** Following procedure shall be adopted for establishing genuineness of the case.

a. Action by the student (Medical Cases)

I. They should report absence from the Examination(s) by fastest possible means to the Controller of Examination. It could be email or written communication by speed post or sent

by hand through any means. In case of Hosteller's, if a student falls sick while residing in the hostel, he/she should seek advice of the available qualified doctor.

II. The said report should preferably be sent prior to the Examination, but not later than 5 days after the last date of the said Examination.

III. The student should on rejoining:

a. Report to the Controller of Examination with complete medical documents to include referral/Prescription slip of the doctor specifically indicating the disease and medicine prescribed, investigation/Lab reports and discharge slip in case of admission should be provided.

b. Submit the Documents to the Controller of Examination, not later than 5 days after the last date of Examination.

IV. In case delay beyond 5 days is anticipated the student should arrange for the medical documents to be sent to the University Medical Officer by hand through a friend / relative etc. and get the said genuineness deposit with the Controller of Examination.

V. No request later than 5 days after the last date of Examination shall be accepted for reasons of ignorance or any other reasons.

b. **Action by students (any other reason)**

In case the student must miss Examination due to genuine reason other than medical, prior written sanction of Vice Chancellor and in his absence, Dean is mandatory. No post facto requests shall be accepted in any case. The approval should be deposited with the Controller of Examination before the examination.

20. Supplementary Examination:

- The supplementary examinations shall be held for each commiserating semester in December for Odd semester and May/June for Even semester, respectively. For the final semester students, there is privilege to appear in the supplementary exams of all pervious semester.
- **Eligibility:** Student with 'F' grade is eligible to appear in the Supplementary Examination.
- **Supplementary for Projects**: There shall be no supplementary examinations for the projects, except make up examination for missing the final viva as per rules outlined above.

21. Grading System: University follows eight letter grading system (A+, A, B+, B, C+, C, D, and F) that have grade points with values distributed on a 10-point scale for evaluating the performance of student. The letter grades and the corresponding grade points on the 10-point scale are as given in the table below.

Academic Performance	**Range of Marks**	**Grades**	**Grade Points**
Outstanding	≥90	A+	10
Excellent	≥80 &< 90	A	9
Very Good	≥70 &< 80	B+	8
Good	≥60 &< 70	B	7
Fair	≥50 &< 60	C+	6
Average	>40 &< 50	C	5

Minimally Acceptable	40	D	4
Fail	< 40	F	0
Incomplete		I	-
Withdrawal		W	-
Grade Awaited		GA	-
S-Satisfactory, US-Unsatisfactory Minor Project		**S/US**	-

- **Description of Grades:**
  - **A.** **D Grade**: The D grades stands for marginal performance, i.e. it is the minimum passing grade in any course. D grade shall not be awarded below 30% marks, though each teacher may set higher marks for same.
  - **B.** **F Grade**: The 'F' grade denotes a very poor performance, i.e. failing a course. A student has to repeat all courses in which she/he obtains 'F' grade, until a passing grade is obtained. In the case of 'F', no Grade points are awarded. However, the credits of such courses shall be used as denominator for calculation of GPA or CGPA.
  - **C.** **W Grade:** The 'W' grade is awarded to a student if he/she is allowed to withdraw for an entire Semester from the University on medical grounds for a period exceeding five weeks.
  - **D.** **'I" Grade:** The 'I' grade is awarded when the student is allowed additional opportunity like make up Examination etc. based on which the grade is to be decided along with other components of the evaluation during the semester 24 An incomplete grade of 'I' may be given when an unforeseen emergency prevents a student from completing the work in a course. The 'I' must be converted to a performance grade (A to F) within 90 days after the first day of classes in the subsequent regular semester.
  - **E.** **X Grade**: It is equivalent to Fail grade but awarded due to student falling below the laid down attendance requirement. Students having X grade shall be required to re-register for the course, when offered next.
- **Cumulative Grade Point Average (CGPA),** it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all Semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

NB: The CGPA can be converted to percentage by using the given formula:

CGPA x 10 = %

e.g. 7.8 x 10 = 78%

- Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (Course title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

22. General Rules: Examinations:

a) Showing the Answer Scripts: The answer scripts of all written Examinations i.e. Mid Term or end semester examination or any other written work conducted by a teacher shall be shown to the

students. Students desirous of seeing the marked answer scripts of end Semester Examination, has to ensure their presence before results are declared, as per dates notified by the Controller of Examination.

b) Marks/Answer Sheets of all other tests shall also be shared with the students and thus, there shall be no scrutiny of grades. However, before the grades are forwarded to Registrar/Controller of Examination, they should be displayed on GU-MS and time given to students, to discuss the same with respective faculty.

c) No appeal shall be accepted for scrutiny of grades.

d) Examination Fee for Supplementary. A prescribed fee will be charged as per course or as decided by the Management from time to time for taking supplementary exams.

23. Improvement of overall Score: A candidate having CGPA < 5.5 and wishes to improve his/her overall score may do so within two academic years immediately after passing the degree program by reappearing into maximum four course(s)/subject(s). The improvement would be considered if and only if the CGPA becomes > 5.5.

24. Program qualifying criteria: For qualifying the Program every student is required to earn prescribed Credits as follows:

a) Certificate in Information Technology (**47 credits)**
b) Diploma in Information Technology (**96 credits)**
c) Bachelors of Science (Information Technology) **(141 credits)**
d) Bachelors of Science (Information Technology) (Hons.) **(184 credits)**

If any student fails to earn prescribed credits for the program, then he/she will get a chance to complete his/her Program in two more years than the actual duration of degree.

25. Revision of Regulations, Curriculum and Syllabi: The University may revise, amend, change or update the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies and the Academic Council as and when required.

26. Conditions for Award of a Degree:

Conditions for Award of a Certificate/Diploma/Degree/Honours: On successful scoring of minimum 4 grade points in all courses of the program, the Certificate/Diploma/Degree/Honours Degree shall be awarded for the candidate.

Classification of Successful Candidates: Grades

The results of successful candidates at the end of II, IV, VI and VIII semesters shall be classified on the basis of Cumulative Grade Point Average (CGPA) obtained in all the II, IV, VI and VIII semesters and Cumulative Grade Point Average (CGPA) for award of:

i. Award the Certificate program in Faculty of Computational Science for completion of first two semesters if the candidate wishes to exit.
ii. Award the Diploma program in Faculty of Computational Science for completion of first four semesters in the program if the candidate wishes to exit.
iii. Award the Bachelor's Degree in Faculty of Computational Science on completion of first six semesters in the program if the candidate wishes to exit.

iv. Award the Bachelor degree with Honours in Faculty of Computational Science for completion of all the eight semesters of the program.

v. Nomenclature of the certificate, diploma, and degrees is mentioned in B.Sc. (IT)Program Structure Model.

vi. Earning a minimum credit as specified in the curriculum of respective program. In case of lateral entry students (direct entry into second year) the minimum credits shall be equivalent to total credits for the program less the credits of first year. This excludes the credits required to be obtained by the student of lateral entry, who is advised to take some equivalence courses.

vii. Should complete the requirements of the certificate/ Diploma/ Degree/ Honours Degree in maximum duration specified for the program. Semester withdrawals due to medical reasons are not counted in two years in certificate, four years for Diploma, six years in Bachelor, eight years in Honour degree. However, forced withdrawal of students e.g. suspension or expulsion or nonattendance by student due to any other reasons, shall count in the maximum period of two years for Certificate, four years for Diploma, five years for Bachelor degree and seven years for Honour degree and minimum period of one years for Certificate, two years for Diploma, three years for Bachelor degree and four years for Honour degree.

viii. Successfully completing the Internship/Training for degree.

ix. Should have cleared all the foundational and core courses of the programs. In case of lateral entry students (direct entry into second year) the student should have completed the foundational/core courses/equivalent courses, as approved at the time of admission in the programs.

Bachelor of Science (Information Technology) Semester I (First year)

Sr. No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Core Course-1	BIT104	Computer Fundamentals	4	0	0	4	4	40	60	100
2.	Core Course-1	BIT124	Computer Fundamentals Lab	0	0	2	1	2	30	20	50
3.	Core Course-2	BIT102	Programming in C	3	1	0	4	4	40	60	100
4.	Core Course-2	BIT122	Programming in C Lab	0	0	4	2	4	30	20	50
5.	Core Course-3	BIT105	Discrete Mathematics	3	1	0	4	4	40	60	100
7.	Ability Enhanced compulsory Courses-1	COM101	English Communication	2	0	0	2	2	40	60	100
8.	Ability Enhanced compulsory Courses-1	COM121	English Communication Lab	0	0	2	1	2	30	20	50
	Ability Enhanced compulsory Courses-2	ENS001	Environmental Studies	2	0	0	2	2	40	60	100
7.	VC-1	***	VC***	3	0	0	3	3	40	60	100
		Total		17	2	8	23	27	330	420	750

Bachelor of Science (Information Technology) Semester II (First year)

Sr. No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Core Course-4	BIT202	Object Oriented Programming using C++	3	1	0	4	4	40	60	100
2.	Core Course-4	BIT222	Object oriented Programming using C++ Lab	0	0	4	2	4	30	20	50
3.	Core Course-5	BIT206	Web development	3	0	0	3	4	40	60	100
4.	Core Course-5	BIT226	Web development Lab	0	0	2	1	2	30	20	50
5.	Core Course-6	BIT207	Digital Electronics	3	0	0	3	3	40	60	100
6.	Core Course-6	BIT227	Digital Electronics Lab	0	0	2	1	2	30	20	50
7.	Core Courses-7	BIT208	Statistical Techniques	3	0	0	3	3	40	60	100
8.	VC-2	***	VC***	3	0	0	3	3	40	60	100
9.	Ability Enhanced compulsory Courses-3	COM201	Business Communication	2	0	0	2	2	40	60	100
10.	Ability Enhanced compulsory Courses-3	COM221	Business Communication Lab	0	0	2	1	2	20	30	50
11.	Ability Enhanced compulsory Courses-4	HVPE101	Human Values and Professional Ethics	2	0	0	2	2	40	60	100
		Total		19	1	10	25	30	390	510	900

Bachelor of Science (Information Technology) Semester III (Second year)

Sr. No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Core Course-8	BIT301	Data Structures	3	1	0	4	4	40	60	100
2.	Core Course-8	BIT321	Data Structures Lab	0	0	4	2	4	30	20	50
3.	Core Course-9	BIT308	Data Communication and Computer Networks	3	1	0	4	4	40	60	100
4.	Core Course-9	BIT328	Data Communication and Computer Networks Lab	0	0	2	1	2	30	20	50
5.	Core Course-10	BIT309	Fundamentals of Operating System	3	0	0	3	3	40	60	100
6.	Core Course-10	BIT329	Fundamentals of Operating System Lab	0	0	2	1	2	30	20	50
7.	Core Course-11	BIT310	Computer Organization and Architecture	3	0	0	3	3	40	60	100
8.	Skill Enhancement Course-1	***	SEC1	2	0	0	2	2	40	60	100
9.	Skill Enhancement Course-1	***	SEC1 Lab	0	0	2	1	2	30	20	50
10.	VC-3	***	VC***	3	0	0	3	3	40	60	100
		Total		17	2	10	24	29	360	440	800

Bachelor of Science (Information Technology) Semester IV (Second year)

Sr. No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Core Course-12	BIT410	Software Engineering and Project Management	4	0	0	4	4	40	60	100
2.	Core Course-13	BIT411	Programming in Java	3	1	0	4	4	40	60	100
3.	Core Course-13	BIT431	Programming in Java Lab	0	0	4	2	4	30	20	50
4.	Core Course-14	BIT403	Database Management System	3	1	0	4	4	40	60	100
5.	Core Course-14	BIT423	Database Management System Lab	0	0	4	2	4	30	20	50
6.	VC-4		VC***	3	0	0	3	3	40	60	100
7.	Ability Enhanced compulsory Courses-5	GWE101	Gender Equality and Women Empowerment	2	0	0	2	2	40	60	100
8.	Skill Enhancement Course -2	***	SEC-2	3	0	0	3	0	40	60	100
9.	Skill Enhancement Course -2	***	SEC-2 Lab	0	0	2	1	2	30	20	50
		Total		18	2	12	26	29	330	420	750

Note: The students must be taken 4-6 weeks summer training in the IT Industry after the fourth semester and evaluate in the fifth semester.

Bachelor of Science (Information Technology) Semester V (Third year)

Sr.No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Discipline Specific Elective-1	***	DSE-1	3	1	0	4	4	40	60	100
2.	Discipline Specific Elective-1	***	DSE-1 Lab	0	0	4	2	4	30	20	50
3.	Discipline Specific Elective-2	***	DSE-2	3	1	0	4	4	40	60	100
4.	Discipline Specific Elective-2	***	DSE-2 Lab	0	0	4	2	4	30	20	50
5.	Discipline Specific Elective-3	***	DSE-3	3	1	0	4	4	40	60	100
6.	Discipline Specific Elective-3	***	DSE-3 Lab	0	0	4	2	4	30	20	50
7.	Skill Enhancement Course -3	***	SEC-3	2	0	0	2	2	40	60	100
8.	Skill Enhancement Course -3	***	SEC-3 Lab	0	0	2	1	2	30	20	50
9.	Project	BIT528	Minor Project	0	0	2	1	2	40	60	100
10.	Industrial Training	BIT529	Industrial Training	-	-	-	2	-	-	-	100
		Total		11	3	16	24	30	320	380	800

Bachelor of Science (Information Technology) Semester VI (Third year)											
Sr. No.	**Category**	**Code**	**Subject**	**Teaching Scheme**			**Credits**	**Hours**	**Examination Scheme**		**TOTAL**
				L	T	P			Internal	External	
1.	Discipline Specific Elective-4	***	DSE-4	3	1	0	4	4	40	60	100
2.	Discipline Specific –	***	DSE-4 Lab	0	0	4	2	4	30	20	50
3.	Discipline Specific Elective-5	***	DSE-5	3	1	0	4	4	40	60	100
4.	Discipline Specific Elective-5	***	DSE-5 Lab	0	0	4	2	4	30	20	50
5.	Discipline Specific Elective-6	***	DSE-6	3	1	0	4	4	40	60	100
6.	Discipline Specific Elective-6	***	DSE-6 Lab	0	0	2	1	2	30	20	50
7.	Skill Enhancement Course -4	***	SEC-4	2	0	0	2	2	40	60	100
8.	Skill Enhancement Course -4	***	SEC-4 Lab	0	0	2	1	2	30	20	50
9.	Project	BIT629	Major Project	0	0	4	2	4	40	60	100
		Total		**11**	**3**	**16**	**22**	**30**	**320**	**380**	**700**

Bachelor of Science (Information Technology) Semester VII (Fourth Year)

Sr No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Core Course - 15	BIT701	Design and Analysis of Algorithm	3	1	0	4	4	40	60	100
2.	Core Course - 15	BIT721	Design and Analysis of Algorithm Lab	0	0	4	2	4	40	60	100
3.	Core Course - 16	BIT702	Big Data and Analytics	3	1	0	4	4	40	60	100
4.	Core Course - 16	BIT722	Big Data and Analytics Lab	0	0	4	2	4	30	20	50
5.	Core Course - 17	BIT703	Operations Research	3	1	0	4	4	40	60	100
6.	Core Course - 18	BIT704	Data Programming for Visualization	4	0	0	4	4	30	20	50
7.	Core Course - 18	BIT724	Data Programming for Visualization Lab	0	0	4	2	4	40	60	100
		Total		13	3	12	22	28	260	340	600

Bachelor of Science (Information Technology) Semester VIII (Fourth Year)

Sr. No.	Category	Code	Subject	Teaching Scheme			Credits	Hours	Examination Scheme		TOTAL
				L	T	P			Internal	External	
1.	Core Course -19	BIT801	Blockchain Technologies	3	1	0	4	4	40	60	100
2.	Core Course -19	BIT821	Blockchain Technologies Lab	0	0	4	2	4	30	20	50
3.	Core Course -20	BIT802	Theory of Computation	3	1	0	4	4	40	60	100
4.	Core Course -21	BIT822	Research Methodology	3	1	0	4	4	40	60	100
5.	Core Course -22	BIT803	Emerging Trends in IT	3	0	3	3	3	30	20	50
6.	Project	BIT850	Research Project	0	0	8	4	8	40	60	100
		Total		12	3	15	21	27	220	280	500

Course Structure

Bachelor of Science in Information Technology B.Sc. (IT)

Core Courses

Sr. No.	Category Type	Course Code	Course Name
1.	Core-1	BIT104	Computer Fundamentals
2.	Core-2	BIT102	Programming in C
3.	Core-3	BIT105	Discrete Mathematics
4.	Core-4	BIT202	Object Oriented Programming using C++
5.	Core-5	BIT206	Web development
6.	Core-6	BIT207	Digital Electronics
7.	Core-7	BIT208	Statistical Techniques
8.	Core-8	BIT301	Data Structures
9.	Core-9	BIT308	Data Communication and Computer Networks
10.	Core-10	BIT309	Fundamentals of Operating System
11.	Core-11	BIT310	Computer Organization and Architecture
12.	Core-12	BIT410	Software Engineering and Project Management
13.	Core-13	BIT411	Programming in Java
14.	Core-14	BIT403	Database Management System
15.	Core-15	BIT701	Design and Analysis of Algorithm
16.	Core-16	BIT702	Big Data and Analytics
17.	Core-17	BIT703	Operations Research
18.	Core-18	BIT704	Data Programming for Visualization
19.	Core-19	BIT801	Blockchain Technologies
20.	Core-20	BIT802	Theory of Computation
21.	Core-21	BIT822	Research Methodology
22.	Core-22	BIT803	Emerging Trends in IT

Core Courses ((Laboratory)

Sr. No.	Category Type	Course Code	Course Name
1.	Core-1	BIT124	Computer Fundamentals Lab
2.	Core-2	BIT122	Programming in C Lab
3.	Core-4	BIT222	Object Oriented Programming using C++ Lab
4.	Core-5	BIT226	Web development Lab
5.	Core-6	BIT227	Digital Electronics Lab
6.	Core-8	BIT321	Data Structures Lab
7.	Core-9	BIT328	Data Communication and Computer Networks Lab
8.	Core-10	BIT329	Fundamentals of Operating System Lab
9.	Core-13	BIT431	Programming in Java Lab
10.	Core-14	BIT423	Database Management System Lab
11.	Core-15	BIT721	Design and Analysis of Algorithm Lab
12.	Core-16	BIT722	Big Data and Analytics Lab
13.	Core-18	BIT704	Data Programming for Visualization Lab
14.	Core-19	BIT821	Blockchain Technologies Lab

A) Ability Enhanced Compulsory Courses (AECC)

Sr. No.	Category Type	Course Code	Course Name
1	AECC1	COM101	English Communication
2	AECC2	ENS101	Environmental Studies
3	AECC3	COM201	Business Communication
4	AECC4	HVPE101	Human Values and Professional Ethics
5	AECC5	GWE101	Gender Equality and Women Empowerment

B) Ability Enhanced Compulsory Courses (AECC) Laboratory

Sr. No.	Category Type	Course Code	Course Name
1	AECC1	COM121	English Communication Lab
2	AECC3	COM221	Business Communication Lab

C) Vocational Courses (VC)

Sr. No.	Category Type	Course Code	Course Name
1	VC1	BIT106	HRM for IT Manager
2	VC1	BBA105	Managerial Economics-I
3	VC2	CAM101	Digital Design
4	VC2	BAM102	Digital Illustration and Image Processing
5	VC3	BIT313	E-Commerce
6	VC3	BIT314	Office Automation
7	VC4	BIT412	Fundamental of Digital Marketing
8	VC4	BIT413	Search Engine Optimization

D) Skill Enhanced Course (SEC)

Sr. No.	Category Type	Course Code	Course Name
1.	SEC1-B	BIT 311	Programming in PHP
2.	SEC1-C	BIT 312	Programming in C#
3.	SEC2-B	BIT414	Shell Programming and Linux Administration
4.	SEC2-C	BIT415	Penetration Testing with Kali Linux
5.	SEC3-B	BIT504	Principles of Information Security
6.	SEC3-C	BIT518	Ethical Hacking Fundamentals
7.	SEC4-B	BIT617	Image Editing Tool
8.	SEC4-C	BIT618	Mobile Application Development

E) Skill Enhanced Course (SEC) Laboratory

Sr. No.	Category Type	Course Code	Course Name
1.	SEC1-B	BIT 331	Programming in PHP Lab

2.	SEC1-C	BIT 332	Programming in C# Lab
3.	SEC2-B	BIT434	Linux and Shell Programming Lab
4.	SEC2-C	BIT435	Penetration Testing with Kali Linux Lab
5.	SEC3-B	BIT524	Principles of Information Security Lab
6.	SEC3-C	BIT538	Ethical Hacking Fundamentals Lab
7.	SEC4-B	BIT637	Image Editing Tool Lab
8.	SEC4-C	BIT638	Mobile Application Development Lab

F) Discipline Specific Elective (DSE)

Sr. No.	Category Type	Course Code	Course Name
1.	DSE1-A	BIT501	Python Programming
2.	DSE1-B	BIT519	Fundamental of Latex
3.	DSE1-C	BIT520	Programming in MATLAB
4.	DSE1-D	BIT510	C#.Net
5.	DSE2-A	BIT511	Computer Graphics and Multimedia
6.	DSE2-B	BIT505	Cloud Computing
7.	DSE2-C	BIT512	Software Testing Methodology
8.	DSC2-D	BIT513	Web applications using ASP.NET
9.	DSE3-A	BIT514	Advanced Web Design and Development
10.	DSE3-B	BIT515	Relational Database Management System
11.	DSE3-C	BIT516	Data Mining
12.	DSE3-D	BIT517	Internet of Things
13.	DSE4-A	BIT620	R Programming
14.	DSE4-B	BIT610	DevOps
15.	DSE4-C	BIT611	Cyber security
16.	DSE4-D	BIT612	Cryptography and Network Security
17.	DSE5-A	BIT606	Advance Java Programming
18.	DSE5-B	BIT619	Data Analytics
19.	DSE5-C	BIT613	Client/Server Computing
20.	DSE5-D	BIT607	Artificial Intelligence
21.	DSE6-A	BIT614	Object Oriented Analysis and Design
22.	DSE6-B	BIT608	Data Science
23.	DSE6-C	BIT615	System Programming
24.	DSE6-D	BIT616	Machine Learning

G) Discipline Specific Elective Lab (DSE)

Sr. No.	Category Type	Course Code	Course Name
1.	DSE1-A	BIT521	Python Programming Lab
2.	DSE1-B	BIT539	Fundamental of Latex Lab
3.	DSE1-C	BIT540	Programming in MATLAB Lab
4.	DSE1-D	BIT530	C#.net Lab
5.	DSE2-A	BIT531	Computer Graphics and Multimedia Lab
6.	DSE2-B	BIT525	Cloud Computing Lab
7.	DSE2-C	BIT532	Software Testing Methodology Lab
8.	DSC2-D	BIT533	ASP.Net Lab
9.	DSE3-A	BIT534	Advanced Web Development Lab
10.	DSE3-B	BIT535	Relational Database Management System Lab
11.	DSE3-C	BIT536	Data Mining Lab
12.	DSE3-D	BIT537	Internet of Things Lab

13.	DSE4-A	BIT640	R Programming Lab
14.	DSE4-B	BIT630	DevOps Lab
15.	DSE4-C	BIT631	Cyber security Lab
16.	DSE4-D	BIT632	Cryptography and Network Security Lab
17.	DSE5-A	BIT626	Advance Java Programming Lab
18.	DSE5-B	BIT639	Data Analytics Lab
19.	DSE5-C	BIT633	Client/Server Computing Lab
20.	DSE5-D	BIT627	Artificial Intelligence Lab
21.	DSE6-A	BIT634	Object Oriented Analysis and Design Lab
22.	DSE6-B	BIT628	Data Science Lab
23.	DSE6-C	BIT635	System Programming Lab
24.	DSE6-D	BIT636	Machine Learning Lab

H) Projects

Sr. No.	Category Type	Course Code	Course Name
1.	Project	BIT528	Minor Project
2.	Project	BIT629	Major Project
3.	Project	BIT850	Research Project

I) Industrial Training

Sr. No.	Category Type	Course Code	Course Name
1.	Industry Training	BIT529	Industrial Training

SYLLABUS

BIT104: **Computer Fundamentals**
Credits: 4
LTP 400

Course Description: The course aims to equip the students with various Office Automation Tools such as Word processor, Spread sheet program & Presentation program.
The course includes Crafting professional word documents; excel spread sheets, power point presentations using the Microsoft suite of office tools.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Use various Office Tools like Word processor, Spread sheet software & Presentation software.
CO2: Acquire the foundation level knowledge required to understand computer and its operations.
CO3: Discuss various peripheral devices like Input and Output devices of Computer systems, online storage devices.
CO4: Describe the hardware and software components of the computer.

Course Content

UNIT I

Introduction to Computers: Introduction, Characteristics of Computers, Block diagram of computer. Types of computers and features, Minicomputers, Micro Computers, Mainframe Computers, Super Computers. Types of Programming Languages (Machine Languages, Assembly Languages, High Level Languages). Data Organization, Drives, Files, Directories. Types of Memory (Primary and Secondary), I/O Devices (Scanners, Plotters, LCD, Plasma Display) Number Systems: Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication.

UNIT II

Algorithm: Definition, Characteristics, Advantages and disadvantages, Examples. Flowchart: Definition, Define symbols of flowchart, Advantages and disadvantages.
Operating System: Definition, Services in OS, Type of OS, DOS as case study.

UNIT III

Word Processing: Typing, Editing, Proofing & Reviewing, Formatting Text & Paragraphs, Automatic Formatting and Styles, Working with Tables, Graphics and Frames, Mail Merge, Automating Your Work & printing Documents.
Excel Spreadsheet: Working & Editing in Workbooks, Creating Formats & Links, formatting a Worksheet& creating graphic objects, Creating Charts (Graphs), formatting and analyzing data, Organizing Data in a List (Data Management), Sharing & Importing Data, Printing.

UNIT IV

PowerPoint Presentations: Getting started in PowerPoint, creating a presentation, Creating & editing slides, previewing a slide show, Adding picture & graph, adding sound & video, adding auto shape, Animating objects.
Spreadsheets and Database packages: Purpose, usage, command, MS-Excel, Creation of files in MS-Access, Switching between applications.

Recommended Books / Suggested Readings:

1. "Computers Today", D. H. Sanders, Fourth Edition, McGraw Hill, 1988.
2. Fundamental of Computers – By V. Rajaraman B.P.B. Publications.
3. "Fundamental of Computers – By P.K. Sinha.
4. MS-Office 2000(For Windows) – By Steve Sagman.
5. "Information Technology Inside and Outside", David Cyganski, John A. Orr, Paperback Edition, Pearson Education 2002.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks

	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT124: Computer Fundamentals Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with various Office Automation Tools such as Word processor, Spread sheet program & Presentation program.
The course includes Crafting professional word documents; excel spread sheets, power point presentations using the Microsoft suite of office tools.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Outline and utilize MS-Word to write text and insert graphical images into file.
CO2: Use Microsoft Office programs to create personal and/or business documents following current professional and/or industry standards.
CO3: Use the mail merge facility.
CO4: Outline and apply MS-Excel and MS-Access to build spreadsheets, charts.

List of Practical:

1. Demonstration of various parts of a Computer System.
2. Starting the Windows, starting a program, running a program, running multiple programs and switching between windows, customizing the Task bar, recycle bin, restoring the deleted files.
3. Creating and removing folders, Making the taskbar wider, arranging icons on the Desktop, Displaying and hiding the taskbar clock, controlling the size of start menu options, Creating Shortcuts.
4. Expanding and collapsing a folder, Recognizing File types using icons, running a program from explorer, renaming a file or folder, Sorting a folder
5. MS Word Basic, Formatting and Miscellaneous Operations using MS Word, Using the special features of word.
6. Implementation of the mail merge feature in word processor.
7. Preparing a Govt. Order / Official Letter / Business Letter / Circular Letter.
8. Covering formatting commands - font size and styles - bold, underline, upper case, lower, case, superscript, subscript, indenting paragraphs, spacing between lines and characters, tab settings etc.
9. Preparing a newsletter: To prepare a newsletter with borders, two columns text, header and footer and inserting a graphic image and page layout.
10. Create an advertisement for your university.
11. Prepare a resume.
12. MS Excel Basics, Using MS Excel, performing various calculations and analyzing data availing, Formulas and Functions, Preparing Charts, Pivot table.
13. Using formulas and functions:
14. To prepare a Worksheet showing the monthly sales of a company in different branch offices (Showing Total Sales, Average Sales).
15. Prepare a Statement for preparing Result of 10 students in 5 subjects (using formula to get Distinction, I Class, II Class and Fail under Result column against each student).
16. MS Presentation Basics, creating a new Presentation based on a template: using Auto content wizard, design template and Plain blank presentation.
17. Creating a Presentation with Slide Transition: Automatic and Manual with different effects.
18. Creating a Presentation applying Custom Animation effects: Applying multiple effects to the same
19. Object and changing to a different effect and removing effects.
20. Creating and Printing handouts.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria:	15 Marks

	• Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT102: Programming in C
Credits: 4
LTP 310

Course Description: The course aims to equip the students with the ability to generate programs in C programming.

The course includes Algorithm development, Unformatted & formatted I/O function in C, branching statements, Decision making & branching.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Apply logic to solve real life problems.
CO2: Implement different Operations on arrays.
CO3: Use functions to solve the given problem.
CO4: Implement file Operations in C programming for a given application.

Course Content

UNIT I

Programming Process: Problem definition, Algorithm development, Flowchart, Coding, Compilation and debugging.

Overview of C: History of C, Importance of C, Structure of a C Program. Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant.

Data input/output. Input/output: Unformatted & formatted I/O function in C, Input functions viz. scanf (), getch (), getche(), getchar(), gets(), output functions viz. printf(), putch(), putchar(), puts().

UNIT II

Operators & Expression: Arithmetic, relational, logical, bitwise, unary, assignment, conditional operators and special operators. Arithmetic expressions, evaluation of arithmetic expression, type casting and conversion, operator hierarchy & associatively.

Control statements: branching statements (if, if else, switch), loop statements (for, while and do-while), jump statements (break, continue, goto), nested control structures.

Decision making & branching: Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, goto statement.

Decision making & looping: For, while, and do-while loop, jumps in loops, break, continue statement**.**

UNIT III

Arrays: One-dimensional and two-dimensional arrays Declaration, initialization, reading values into an array, displaying array contents.

Functions: Definition, prototype, passing parameters, recursion.

Storage classes in C: auto, extern, register and static storage class, their scope, storage, & lifetime.

Strings: input/output of strings, string handling functions (strlen, strcpy, strcmp, strcat&strrev), and table of strings.

UNIT IV

Structures and unions: using structures and unions, comparison of structure with arrays and union.

Pointers: pointer data type, pointer declaration, initialization, accessing values using pointers, pointers and arrays.

File handling: Definition of Files, Opening modes of files, Standard function-(fopen ( ), fclose ( ), feof ( ), fseek ( ), rewind ( )).

Recommended Books / Suggested Readings:

1. E. Balagurusamy, “Programming in C”, Tata McGraw Hill.
2. Kernighan and Ritchie, “The C Programming Language”, PHI.
3. Byron Gotfried, “Programming in C”.
4. Kamathane, “Programming in C”, Oxford University Press.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT122: Programming in C Lab
Credits: 2
LTP: 004

Course Description: The course aims to equip the students with the ability to generate programs in C programming.

The course includes Algorithm development, Unformatted & formatted I/O function in C, branching statements, Decision making & branching.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Test and execute the programs and correct syntax and logical errors.
CO2: Acquire knowledge about the basic concept of writing a program in C programming language.
CO3: Apply programming to solve simple problems.
CO4: Describe the role of Functions involving the idea of modularity.

List of Practical:

1. Simple C programs using variables, keywords and simple operations
2. Programs based on operators (arithmetic, relational, increment, decrement, conditional, logical).
3. Write a C program to find the sum of individual digits of a positive integer.
4. Programs based on looping (while do while, for), nested loops-based programs.
5. Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
6. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7. Write a C program to calculate the following Sum: Sum=1-x2/2! +x4/4! -x6/6! +x8/8! -x10/10!
8. Write a C program to find the roots of a quadratic equation.
9. Write a C program to generate Pascal's triangle.
10. Write a C program to construct a pyramid of numbers.
11. Branching statement programs using ‘C’
12. Programs based on arrays (single, two dimensional).
13. Write a C program that uses functions to perform the following: i) Addition of Two Matrices ii) Multiplication of Two Matrices.
14. Programs on user defined functions (call by value, call by reference).
15. String/Character based exercises manipulation on strings
16. Write a C program to determine if the given string is a palindrome or not.
17. Programs based on pointers (arithmetic operation, arrays with pointers)
18. Programs on structure and union.
19. Programs on file handling.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks

	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT105: Discrete Mathematics
Credits: 4
LTP 310

Course Description: The course aims to equip the students with the ability to construct and understand mathematical proofs.
The course includes set theory, relation, function, combinatorics, graph theory, trees.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the working with mathematical notation and common concepts in discrete mathematics.
CO2: Describe the basic concepts in set theory, logic, combinatorics, and graph theory.
CO3: Describe the challenges for theoretical Computer Science and its contribution to other sciences.
CO4: Discuss the concepts recursive mathematical definitions, basics of counting, permutations, combinations.

Course Content

UNIT I

Set Theory: Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets).

UNIT II

Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation,
Function: Definition and types of function, composition of functions, recursively defined functions.

UNIT III

Propositional logic: Proposition and Compound Propositions, basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Duality law, Algebra of propositions, Conditional and Bi conditional Statements, Arguments, Logical Implication, Propositional Functions, Predicates and Quantifiers, Negation of Quantified Statements.

UNIT IV

Combinatorics: Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion.

Recommended Books / Suggested Readings:

1. Liu C.L., Elements of Discrete Mathematics, McGraw Hill Int. edn.
2. Kolman B & Busby C.R., Discrete Mathematical Structure for Computer Science, Prentice Hall of India Ltd.
3. Seymour Lipschutz, M. Lipson, “Discrete Mathematics” Tata McGraw Hill, 2005.
4. Deo N., Graph Theory, Prentice Hall of India.
5. Trembley J.P. &Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks

Total	100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT202: Object Oriented Programming using C++
Credits: 4
LTP 310

Course Description: The course aims to equip the students with the ability to understand and implement features of OOP.
The course includes Classes & Objects, Inheritance, Abstraction, Polymorphism, Exception Handling.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Develop applications using Object Oriented Programming Concepts.
CO2: Demonstrate the differences between traditional imperative design and object-oriented Design.
CO3: Explain class structures as fundamental, modular building blocks.
CO4: Describe the role of inheritance, polymorphism, and generic structures in building reusable code.
Course Content

UNIT I

Object Oriented Concepts: Introduction to Objects and Object-Oriented Programming, Encapsulation (Information Hiding), Access Modifiers: Controlling access to a class, method, or variable (public, protected, private, package), Other Modifiers, Polymorphism: Overloading, Inheritance, Overriding, Abstract Classes, Reusability.

UNIT II

Class Declaration: Data Members, Member Functions, Private and Public Members, Data Hiding and Encapsulation, Array within a class.
Class Function Definition: Member Function definition inside the class and outside the class, Friend Function, Inline Function, Static Members & Functions, Scope Resolution Operator, Private and Public Member Functions, Nesting of Member Functions. Creating Objects, accessing class data members, accessing member functions, Arrays of Objects, Objects as function arguments: Pass by value, Pass by reference, Pointers to Objects.

UNIT III

Constructors and Destructors: Declaration and Definition, Default Constructors, Parameterized Constructors, Constructor Overloading, Copy Constructors. Destructors: Definition and use.
Memory Management: New, Delete, garbage collection.
Inheritance: Extending Classes Concept of inheritance, Base class, Derived class, defining derived classes, Single inheritance: Privately derived, publicly derived; Making a protected member inheritable, Access Control to private and protected members by member functions of a derived class, Multilevel inheritance, Nesting of classes. Function Overloading & Operator Overloading Binary & Unary.

UNIT IV

Polymorphism: Definition, early Binding, Polymorphism with pointers, Virtual Functions, late binding, pure virtual functions.
Operator Overloading: Introduction, Fundamentals of Operator Overloading, Restrictions on Operators Overloading, Operator Functions as Class Members vs. as Friend Functions, Overloading, «, ».
Files: file stream, file pointer and manipulation, file open and close, sequential and random access.
Exception Handling: Principle of Exception handling, Exception handling mechanism, Multiple catch, Nested try, re throwing the Exception.
Recommended Books / Suggested Readings:

1. Object Oriented Programming with C++, E. Balagurusamy, Fourth Edition, Tata Mc-Graw Hill
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition Galgotia Publications.
3. The C++ Programming Language, BjarnaStroustrup, Third Edition, Addison-Wesley Publishing Company.
4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT222: Object Oriented Programming using C++ Lab

Credits: 2

LTP 004

Course Description: The course aims to equip the students with the ability to understand and implement features of OOP.

The course includes Classes & Objects, Inheritance, Abstraction, Polymorphism, Exception Handling.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Apply object-oriented programming features to program design and implementation

CO2: Demonstrate the ability to analyze, use, and create functions, classes, to overload operators.

CO3: Demonstrate the ability to understand and use inheritance and Pointers when creating or using classes and create templates

CO4: Demonstrate the ability to understand and use Exception handling and file handling mechanism.

List of Practical:

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series S = 1+1/2+1/3+1/4+……
4. WAP to compute the sum of the first n terms of the following series S =1-2+3-4+5…….
5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate 7 the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to perform following actions on an array entered by the user: i) Print the even-valued elements ii) Print the odd-valued elements iii) Calculate and print the sum and average of the elements of array iv) Print the maximum and minimum element of array v) Remove the duplicates from the array vi) Print the array in reverse order The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
10. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
11. Write a program that swaps two numbers using pointers.
12. Write a program in which a function is passed address of two variables and then alter its contents.
13. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main () function.
14. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc () / calloc () functions or new operator.
15. Write a menu driven program to perform following operations on strings: a) Show address of each character in string b) Concatenate two strings without using strcat function. c) Concatenate two strings using strcat function. d) Compare two strings e) Calculate length of the string (use pointers) f) Convert all lowercase characters to uppercase g) Convert all uppercase characters to lowercase h) Calculate number of vowels i) Reverse the string
16. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array. 18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration.
17. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration.
18. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
19. Create Matrix class using templates. Write a menu-driven program to perform following Matrix operations (2-D array implementation): 8 a) Sum b) Difference c) Product d) Transpose
20. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
21. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.

22. Create a class Box containing length, breath and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -- operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid Write a program which takes input from the user for length, breath and height to test the above class.
23. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
24. Write a program to retrieve the student information from file created in previous question and print it in following format: Roll No. Name Marks
25. Copy the contents of one text file to another file, after removing all whitespaces.
26. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.
27. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers. The program will print the array elements in ascending and descending order.
28. WAP to show function Overloading and operator overloading.
29. WAP to create a class and access member function of a class.
30. Write a program to show Constructor and Destructor in a class.
31. Write a program to show the concept of inheritance in classes.
32. Write a program to implement file handling concepts.
33. Write a program to implement the exception handling.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT206: Web Development
Credits: 3
LTP 300

Course Description: The course aims to equip the students with a comprehensive study of theWeb Technologies.
The course includes HTML, CSS, JavaScript.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Apply the role of languages like HTML, DHTML, CSS, XML, JavaScript, VBScript, PHP and protocols in the workings of the web and web applications.

CO2: Create web pages using HTML, DHTML and Cascading Styles sheets.

CO3: Analyze and build interactive web applications.

CO4: Create XML documents and XML Schema.

Course Content

UNIT I

Introduction: History of the web, Growth of the Web, Protocols governing the web, Web project, Web Team, Team dynamics, World Wide Web, Web browsers, Markup Languages, Style Sheet technologies, client side, server side, HTML Headings, Links, images, Lists, Tables, Forms, Frames.

UNIT II

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML.

Java Script: Introduction, Documents, Documents, forms, statements, functions, objects in Java Script, Events and Event Handling,
Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

UNIT III

Introduction to Web Development: Website Webpage, Static Website, Dynamic Website.

XML: Introduction, Display and XML Documents, Data Interchange with an XML document, Document types definitions, Parsers using XML, Client-side usage, Server-Side usage.

UNIT IV

Introduction to Cascading Style Sheets: Concept of CSS, Creating Style Sheet, Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables ,CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.

Recommended Books / Suggested Readings:

1. Deitel, Deitel and Neito, INTERNET and WORLD WIDE WEB –How to program, Pearson Education Asia, 5thEdition , 2011.HTML & CSS: The Complete Reference, Thomas Powell, Fifth Edition.
2. Achyut S Godbole and AtulKahate, “Web Technologies”, Second Edition, Tata McGraw Hill, 2012.
3. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, TataMcGraw Hill, 2013.
4. HTML A Beginner's Guide Wendy L. Willard, Fourth Edition
5. HTML, XHTML and CSS All-In-One for Dummies Andy Harris, Second Edition
6. JavaScript, A Beginner's Guide John Pollock, Third Edition
7. Professional JavaScript for Web Developers (Wrox Programmer) Nicholas C. Zakas, Second Edition

Websites:

1. www.w3schools.com
2. www.html.net
3. www.thesitewizard.com
4. www.learndreamweavertutorials.com

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT226: Web Development Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of the Web Technologies.
The course includes HTML, CSS, JavaScript.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Create web pages using HTML and Cascading Styles sheets.
CO2: Build dynamic web pages using JavaScript**.**
CO3: Analyze a web page and identify its elements and attributes.
CO4: Design web pages.

List of Practical:

1. Preparation of Biodata using Forms in HTML.
2. Simple Calculation a) Inventory Calculation.
3. Input Validation a) Payroll maintenance.
4. Event Handling a) Changing the Background Color of the Window.
5. Develop a Dynamic Web page Using CSS properties and elements for a university website.
6. To generate the random numbers and display in a table format.
7. Generation of Fibonacci series.
8. Different Pascal triangle generation.
9. Function to determine the pair of integers whether the second integer is multiple of the first.
10. Quiz program.
11. Create a guessing number game.
12. HTML form validation.
13. Program to implement the concept of operator, arrays and functions.
14. Program to communicate between two web pages using PHP.
15. Program to create session and cookies.
16. Program for file manipulation in PHP.
17. Create a database with two tables in MYSQL and perform the basic query operations.
18. Demonstration of joining tables and usage of sub queries.
19. Working with string, numeric and date functions in MYSQL.
20. Develop an application for the demonstration of database connectivity to PHP with MySQL.
21. Develop a simple application for student academic performance.

Websites:

1. www.w3schools.com
2. www.html.net
3. www.thesitewizard.com
4. www.learndreamweavertutorials.com

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks

	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT207: Digital Electronics
Credits: 3
LTP 300

Course Description:
The course aims to equip the students with demonstrate the operation of simple digital gates, identify the symbols, truth table for gates; change binary, hexadecimal, octal numbers to their decimal equivalent and vice versa, demonstrate the operation of a flip-flop. Convert digital into analog and vice versa.

Course Outcome (CO): The students will be able to:
CO1: Describe the logic gates and digital number system.
CO2: Develop a digital logic.
CO3: Apply it to solve real time problems.
CO4: Design various combinational and sequential circuits.

Course Content

UNIT I

Fundamental concepts: Introduction, Digital Signals, Basic Gates and derived Gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR, Boolean Algebra.

Number System and codes: Introduction to number systems, Decimal, Binary, Octal, Hexadecimal, And Conversation from one number system to another number system. Binary Arithmetic: Addition, Subtraction, Multiplication, Division, Half adder, full adder.1's and 2's compliment of Binary Number. Codes: BCD Code, Excess-3 Code, Gray Code Error detecting and correcting codes.

UNIT II

Combinational Logic Design: Standard Representation of logical functions, SOP, POS Forms, K-map Representation of logical functions, and Simplification of logical functions using K-map. Multiplexer, De-multiplexer. Encoder, Decoder.

UNIT III

Flip Flops: 1-Bit Memory Cell, Clocked S-R Flip Flop, J-K Flip Flop, Master Slave Flip Flop, D-type Flip Flop, T-type Flip Flop.

UNIT IV

Sequential Logic Design: Registers, Shift Register, Counter, Synchronous and asynchronous Counter, examples of each.

Timing Circuits and Converters: 555 Timer, Digital to Analog Converter, Analog to Digital Converter.

Recommended Books / Suggested Readings:

1. Modern Digital Electronics by R.P. Jain, McGraw-Hill Science/Engineering/Math Microprocessor by B.RAM, DhanpatRai.
2. Digital Electronics and Logic Design by B. Somanathan Nair, PHI Learning Pvt. Ltd.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT227: Digital Electronics Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with the representation of numbers in a computer system, and how digital circuits can be designed using logic gates and flip-flops.

Course Outcomes:
Upon successful completion of the course, the students should be able to:
CO1: Demonstrate Truth-tables and logic gates.
CO2: Describe the process of designing combinational logic circuits.
CO3: Describe the process of designing the digital counter.
CO4: Demonstrate Multiplexer circuits.

List of Practical:

1. To verify the Truth-tables of all logic gates.
2. To realize and verify the Half & full adder circuits using logic gates.
3. To realize Half and full subtractor circuits using logic gates.
4. To realize Encoder and Decoder circuits
5. To realize Multiplexer circuits
6. To realize 4-bit binary-gray & gray-binary converters.
7. To realize Full adder & full subtractor circuits using encoder.
8. To design Full adder & full subtractor circuits using multiplexer.
9. To design and verify the Truth tables of all flip-flops.
10. To design Mod-6/Mod-9 synchronous up-down counter.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT208: Statistical Techniques
Credits: 4
LTP 310

Course Description: The students will be able to understand, learn and use knowledge of statistics and mathematics for a successful career in risk assessment and management career. This course aims to provide an opportunity to students to learn and develop the skills necessary to enter a professional or academic career.

Course Outcomes (CO): After completion of this course students will be able to

CO1: Implement the basic ideas of statistics including measures of central tendency and measures of dispersions.

CO2: Solve problems associated with Arithmetic Mean, Median, and Mode for grouped as well as ungrouped data, Quartiles, Deciles and Percentiles, Quartiles, Range, Quartile Deviation, Mean Deviation, Standard Deviation, Variance and Combined Variance.

CO3: Implement the basic ideas of statistics including Curve fitting by method of least squares and testing of significance.

CO4: Explain Mutually Exclusive and Exhaustive Events, Complimentary events, Classical definition of Probability, Addition theorem, conditional probability and Independence of Events: P (A ∩ B) = P(A) P(B).

UNIT I

Basic Statistics: Tabulation, Classification and Graphical representation of the data (Pie Chart, Bar Diagram, Histogram, Frequency Polygon, Ogive Curve etc.)

UNIT II

Measures of Central tendency: Arithmetic Mean, Median, Quartiles, Percentiles and Deciles, Mode.

UNIT III

Measures of Dispersion: Range, Mean Deviation, Standard Deviation, Variance and Coeff. Of Variation.

UNIT IV

Basic Probability: Elementary Events, Sample Spaces, Compound Events, Types of Events, Mutually Exclusive, Independent events, Baye's Theorem, addition law of probability, conditional probability, Multiplication theorem of Probability.

Recommended Books / Suggested Readings:

1. Gupta, S.P.: Statistical Methods 1981
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968
5. Croxton, Cowden and Klein.: Applied General Statistics 1973.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. Kapur and Saxena: Mathematical Statistics.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks

	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT301: Data Structures
Credits: 4
LTP 310

Course Description: The course aims to equip the students with the knowledge of data structures and algorithms.

The course includes arrays, stacks & queues, recursion, linked lists, graphs, trees.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Demonstrate familiarity with major algorithms and data structures.

CO2: Analyze performance of algorithms and choose the appropriate data structure and algorithm design method for a specified application.

CO3: Determine which algorithm or data structure to use in different scenarios and be familiar with writing recursive methods.

CO4: Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs and Use various data structures effectively in application programs.

Course Content

UNIT I

Basic Concepts: Data objects and Structures, Algorithm Specification-Introduction, Recursive algorithms, Data Abstraction, Performance analysis-time complexity and space complexity, Examples, Introduction to Linear and Non-Linear data structures.

Array: Array, using one dimensional array, implementing one dimensional array, two-dimensional array, multi-dimensional array.

UNIT II

Stacks and Queues: Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, recursion-tower of Hanoi, introduction and primitive operation on queues, D- queues and priority queues.

Recursion: Introduction, Recursion Properties, Applications of Recursion (Factorial, Addition of Two Number, Power of A Number, Fibonacci Series, Multiplication of Two Number, Tower of Hanoi.) Advantages and Disadvantages of Recursion.

UNIT III

Linked List: Linear list ADT-array representation and linked representation, Singly Linked Lists- Operations-Insertion, Deletion, Circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations- Insertion, Deletion.

Tree: definition, terminology, Binary trees-definition, Properties of Binary Trees, Binary Tree ADT, representation of Binary Trees-array and linked representations, Binary Tree traversals, Threaded binary trees.

UNIT IV

Graphs: Definitions, Terminology, Applications and more definitions, Properties, Graph Representations-Adjacency matrix, Adjacency lists, Graph Search methods - DFS and BFS, Complexity analysis.

Searching: Linear Search, Binary Search, Hashing.

Sorting: Insertion Sort, Selection Sort, Radix Sort, Quick sort, Heap Sort, Merge sort.

Recommended Books / Suggested Readings:

1. E.Horowiz and S.Sahani, " Fundamentals of Data structures", Galgotia Book source Pvt. Ltd.,
2. 2003.
3. R.S.Salaria, "Data Structures & Algorithms" Khanna Book Publishing Co. (P) Ltd., 2002.
4. Y.Langsamet. Al., "Data Structures using C and C++", PHI, 1999.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks

	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT321: Data Structures Lab

Credits: 2

LTP 004

Course Description: The course aims to equip the students with the knowledge of data structures and algorithms.

The course includes arrays, stacks & queues, recursion, linked lists, graphs, trees.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Design and analyze the time and space efficiency of the data structure

CO2: Analyze run-time execution of previous learned sorting methods, including, merge sort, and Quick sort.

CO3: Identity the appropriate data structure for given problem

CO4: Use various data structures effectively in real time applications.

List of Practical:

1. To delete an element from Kth position of Array.
2. To insert an element ITEM at Kth position of Array.
3. To insert an element Item in Sorted Array.
4. To implement the operation of Push, Pop and to know the status of stack.
5. An implement to check the status of stack.
6. To find factorial of a number using Recursion.
7. To find multiplication of two number using Recursion.
8. To simulation the game of Tower of Hanoi using recursion.
9. To implement the operation of insertion and deletion on Queue.
10. A menu driven program to implement the operation of addition, deletion, searching, traversing, reversion, sorting, counting number of nodes and at the end erasing the link list.
11. Implementation of stack using linked list.
12. Implementation of Queue using linked list.
13. To create binary search tree, traverse it and find number of leaves and total nodes in the Tree.
14. To arrange the list of number in a Sorted order using Merge Sort.
15. To arrange the list of number in the Sorted order using Quick sort.
16. To checks all the element of list is in sorted order or not.
17. To search an element using sequential or linear search. At the end display time required to search an element including number of comparisons.
18. Write a program in C to find the location of the first node containing ITEM and find the location of an edge in the graph G.
19. Write a program in C to insert new nodes to a graph G and delete a node from a graph G.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks

	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT308: Data Communication and Computer Networks

Credits: 4

LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the Principles of Computer Communications and Networks.

The course includes Types of Computer Networks, OSI reference model, Physical and data link layer Concepts, Network Hardware Components.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Identify and describe the system functions in the correct protocol layer and further describe how the layers interact.

CO2: Describe the various data communication concepts.

CO3: Explain and calculate digital transmission over different types of communication media.

CO4: Define the concept of local area networks, their topologies, protocols and applications

Course Content

UNIT I

Overview of Computer Communications and Networking: Introduction to Computer Communications and Networking, Introduction to Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

UNIT II

Essential Terms and Concepts: Computer Applications and application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes, analog and Digital Communications, Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

Network Hardware Components: Introduction to Connectors, Trans receivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, switches Vs Routers.

UNIT III

Physical Layer: Introduction: Network topologies; Linear Bus Topology, Ring Topology, Star Topology, Hierarchical or Tree Topology, Topology Comparison, Considerations when choosing a Topology: Switching; Circuit switching, Message switching, Packet switching, Implementation of packet switching, Relationship between Packet Size and Transmission time, Comparison of switching techniques: Multiplexing; FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing, TDM – Time division multiplexing.

Transmission medium; Guided & Unguided Transmission medium, Twisted pair, Coaxial cable, Optical fiber, Comparison of fiber optics and copper wire: Wireless transmission; Electromagnetic spectrum, Radio transmission, Microwave transmission.

UNIT IV

Design issues of DLL; Services provided to the Network layer, Framing, Error control, Flow control, Link Management, ARQ strategies: Error Detection and correction; Parity bits, Importance of flaming distance for error correction.

Design issues of Network layer; Nature of the service provided, Internal organization, Routing, Congestion control, Internetworking: Principles of Routing; Types of routing algorithms, Classes of routing algorithms, Properties of routing algorithms, Optimality principle: Routing algorithms; Shortest path algorithm, Flooding, Distance vector routing, Hierarchical routing, Link state routing, Comparison of routing algorithms: Congestion; Factors of congestion, Comparison of flow control and congestion control, General principles of congestion control, Closed loop solution: IP protocol (IPV4)

Recommended Books / Suggested Readings:

1. Data Communications and Networking –Behrouz A. Forouzan, Fourth Edition MC GRAW HILL EDUCATION, 2006.
2. Principles of Computer Networks and Communications, M. Barry Dumas, Morris Schwartz, Pearson.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rdEdition, Pearson Education.\

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT328: Data Communication and Computer Networks Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of the Computer Networks. The course includes networking components and devices, TCP/IP, Proxy server, Ftp server.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Demonstrate the installation and configuration of network simulator.
CO2: Demonstrate and measure different network scenarios and their performance behavior.
C**O3:** Describe the Packet Tracer software.
CO4: Design and setup an organization network using packet tracer.

List of Practical:

1. Familiarization with networking components and devices: LAN Adapters, Hubs, Switches, Routers etc.
2. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
3. Study of various LAN topologies and their creation using network devices, cables and computers.
4. Study of network IP.
5. Connect the computers in Local Area Network.
6. Study of basic network command and Network configuration commands.
7. Configuration of TCP/IP Protocols in Windows and Linux.
8. Implementation of resource sharing (file, printer etc.)
9. Designing and implementing class A, B and C networks.
10. To configure dynamic IP address for a computer connected to a LAN.
11. To configure proxy server.
12. Installation of ftp server and client.
13. Introduction to Packet Tracer 5.3 & Simple 5 PC's network
14. Configure network Topology using packet tracer software.
15. Setting up first network in LAN and WAN.
16. Distance Vector routing protocol.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT309: Fundamentals of Operating System

Credits: 3

LTP 300

Course Description: The course aims to equip the students with the structure and operations of an Operating System.

The course includes Process Management, Disk Management, Process communications.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Analyze the structure of OS and basic architectural components involved in OS design.
CO2: Describe the concepts of Process Management, Process communications.
CO3: Describe the concepts of Memory Management techniques, Virtual Memory and page replacement algorithms
CO4: Describe the concepts of Storage Management, Disk Management and disk scheduling.

Course Content

UNIT I

Introduction: Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems.

Operating System Organization: Processor and user modes, kernels, system calls and system programs.

UNIT II

Process Management: System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-process communication; deadlocks.

UNIT III

Memory Management: Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory.

File and I/O Management: Directory structure, file operations, files allocation methods, device management.

UNIT IV

Advanced Topics: Introduction to Distributed Operating system, Characteristics, architecture, Issues, Communication & Synchronization; Introduction Multiprocessor Operating system, Architecture, Structure, Synchronization & Scheduling; Introduction to Real-Time Operating System, Characteristics, and Structure & Scheduling.

Recommended Books / Suggested Readings:

1. Operating System Principles by Abraham Silberschatz and Peter Baer Galvin, Seventh Edition, Published by Wiley-India.
2. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
4. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
5. W. Stallings, Operating Systems, Internals & Design Principles 2008 5th Edition, Prentice Hall of India.
6. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks

	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT329: Fundamentals of Operating System Lab

Credits: 1

LTP 002

Course Description: The course aims to equip the students with the structure and operations of an Operating System. The course includes Process Management, Disk Management, and Process communications.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Implement basic services and functionalities of the operating system using system calls.

CO2: Use modern operating system calls and synchronization libraries in software/ hardware interfaces

CO3: Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.

CO4: Implement memory management schemes and page replacement schemes.

List of Practical:

1. Installation of windows OS.
2. Dual boot installation of Operating systems.
3. Write C program to implement FCFS scheduling algorithm.
4. Write C program to implement Round Robin scheduling algorithm.
5. Write C program to implement SJF scheduling algorithm.
6. Write C program to implement non-preemptive priority-based scheduling algorithm.
7. Write C program to implement preemptive priority-based scheduling algorithm.
8. Write C program to implement SRJF scheduling algorithm.
9. Write C program to calculate sum of n numbers using thread library.
10. Write C program to implement first-fit, best-fit and worst-fit allocation strategies.
11. Write C programs to simulate the following File organization techniques: a) Single level directory, b) Two level& c) Hierarchical.
12. Write C programs to simulate the following File allocation methods: a) Contiguous b) Linked c) Indexed.
13. Write C programs to simulate the following page replacement algorithms: a) FIFO b) LRU c) LFU.
14. Shell Programming: Basic Shell Commands.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT310: Computer Organization and Architecture
Credits: 3
LTP 300

Course Description: The course aims to equip the students with the structure, function and characteristics of computer systems.
The course includes, types of buses, CPU, memory unit.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the basic structure and operation of a digital computer system.
CO2: Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.
CO3: Describe the basic Computer Organization and Design.
CO4: Describe the functions of CPU and Memories.
Course Content

UNIT I

Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.

UNIT II

Common Bus System: Introduction to Common Bus System, Types of Buses (Data Bus, Control Bus, Address Bus), 16-bit Common Bus System--Data Movement among registers using Bus.
Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

UNIT III

Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.
Basic Computer Organization and Design: Instruction codes, computer instruction, timing and control, execution and instruction, input-output and interrupt, design of computer.

UNIT IV

Central Processing Unit: General register organization, Stack organization, Instruction Formats, Addressing modes.
Memory: Main memory, Auxiliary memory, Virtual memory, DMA-control signals for DMA transfers, Block diagram of DMA controller, DMA transfer in a microcomputer system.
Recommended Books / Suggested Readings:

1. Computer System Architecture-M. Mano, Pearson Education.
2. Computer Organization, Fifth edition-Carl Hamacher, McGraw-Hill.
3. Digital Design-M. M. Mano, Pearson Education Asia.
4. Computer Fundamentals-B. Ram, New Age International Publishers.
5. M.Moris Mano, Computer System Architecture, 2nd Edition Prentice Hall of India (1991).
6. Heuring and Jordan, Computer systems design and Architecture, Pearson Education (2003).
7. William Stallings, Computer Organization and Architecture, Pearson Education (2003).
8. Floyd, Digital Fundamentals, 8th Edition, Pearson Education (2003).

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks

	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT410: Software Engineering and Project Management
Credits: 4
LTP 400

Course Description: The course aims to equip the students with a comprehensive study of Software Engineering. The course includes Software life cycle models, Software Metrics, Software Design, and Software Testing.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Describe the different techniques and models on which software development is based.
CO2: Analyze software requirements specifications for different projects
CO3: Develop some basic level of software architecture/design
CO4: Apply standard coding practices
CO5: Define the basic concepts and importance of Software project management concepts like cost estimation, scheduling and reviewing the progress.
CO6: Apply different testing and debugging techniques and analyzing their effectiveness.

Course Content

UNIT I

Introduction: The Problem Domain, Software Eng. Challenges, Software Eng. Approach. Program Vs Software, and Software process, Software Characteristics, Brief introduction about product and process, Software process and product matrices.
Software life cycle models: Definition, Waterfall model, Increment process models, Evolutionary process models, Selection of a life cycle model.
Process Framework Models: Capability maturity model (CMM), ISO 9000.

UNIT II

Software Requirement Analysis and Specification: Requirements Engineering, type of requirements, Feasibility Studies, Requirement Elicitation, Various steps for requirement analysis, Requirement documentation, Requirement validation, an example to illustrate the various stages in Requirement analysis**.**
Planning phase: project planning objective, software scope, empirical estimation models COCOMO, single variable model, staffing and personal planning.
Software Metrics: Definition, Importance, Categories of metrics.

UNIT III

Software Design: Definition, Various types, Objectives and importance of Design phase, Modularity, Strategy of design, Function oriented design, IEEE recommended practice for software design descriptions.
Coding: Programming Principles and Guidelines, Verification-code inspections, static analysis.

UNIT IV

Software Testing: What is testing, Test, Test case and Test Suit, Verification and Validation, Alpha, beta and acceptance testing, functional testing, techniques to design test cases, boundary value analysis, Equivalence class testing, decision table-based testing, cause effect graphing technique, Structural testing, mutation testing.
Project scheduling and tracking: Basic concepts-relation between people and effort-defining task set for the software project-selecting software engineering task.

Recommended Books / Suggested Readings:

1. An Integrated approach to Software Engineering, Third Edition 2005, Pankaj Jalote, Narosa Publications.
2. Software Engineering, Revised Second Edition, K.K. Aggarwal, Yogesh Singh, New Age International Publishers.
3. Software Engineering –A Practitioner's Approach, Fifth Edition, Roger. S. Pressman, McGraw Hill.
4. Ian Sommerville Software Engineering VII th Edition Pearson Education.
5. K K Aggarwal, Yogesh Singh, Software Engineering (Third Edition) New Age International Publication.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT411: Programming in Java
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the Java Programming. The course includes Decision Making & Branching, Looping, Classes and Objects, Arrays, Multithreaded Programming.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Describe the principles and practice of object-oriented analysis and design in the construction of robust, maintainable programs, which satisfy their requirements.

CO2: Demonstrate the principles of object-oriented programming.

CO3: Demonstrate the ability to use simple data structures like arrays in a Java program.

CO4: Describe the concept of package, interface, multithreading and File handling in java.

Course Content

UNIT I

OOPs: Object oriented paradigm, Basic Concepts of OOP, Benefits of OOP, and Applications of OOP.

Overview of java language: Introduction, Challenges of Java, Java Features, Java Program Development, Java tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Command line arguments.

Constants, Variables & Data Types: Introduction, Constants, Variables, Data Types, Declaration of Variables, Giving Value to Variables, Scope of Variables, Symbolic Constants, Type Casting, Getting Value of Variables, Standard Default Values; Operators & Expressions.

Decision Making & Branching: Introduction, Decision making with if statement, Simple if statement, if. Else statement, Nesting of if else statements, the else if ladder, the switch statement, the conditional operator.

Looping: Introduction, The While statement, the do-while statement, for statement, Jumps in loops.

UNIT II

Classes and Objects: Basic concepts of OOPS, Classes and Objects, Modifiers, Passing arguments, Constructors, Overloaded Constructors, Overloaded Operators, Static Class Members, Garbage Collection.

Arrays: One-dimensional arrays, Creating an array, Two dimensional arrays, Strings, Vectors, Wrapper classes.

Inheritance: Basics of inheritance, Inheriting and Overriding Superclass methods, Calling Superclass Constructor, Polymorphism, Abstract Classes, Final Class.

Strings: String class, string concatenation, Comparing strings, Substring, Difference between String and String Buffer class, String Tokenizer class.

UNIT III

Interface and Packages: Basics of interface, Multiple Interfaces, Multiple Inheritance Using Interface, Multilevel Interface, Packages: Create and Access Packages, Static Import and Package Class, Access Specifiers.

Exception Handling: Introduction, Try and Catch Blocks, Multiple Catch, Nested Try, Finally, Throw Statement, Built-In Exceptions.

UNIT IV

Multithreaded Programming: Introduction, Creating Threads, Extending the Threads, Stopping and Blocking a Thread, Lifecycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the 'Runnable' Interface.

Applets: Introduction, Applet Class, Applet Life Cycle, Graphics in Applet, Event-Handling.

File and I/O Streams: File Class, Streams, Byte Streams, Filtered Byte Streams, Random Access File Class, Character Streams**.**

Recommended Books / Suggested Readings:

1. Programming with Java A Primer, 5th Edition, E. Balagurusamy, TMH.
2. Java Programming for Core and Advanced Learners, Sagayaraja, Denis, Karthik, Gajalakshmi, Universities Press.
3. Java Fundamentals, A Comprehensive Introduction, H. Schildt, D. Skrien, TMH.
4. Java, The complete Reference, H. Schildt, 7th Edition, TMH.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT431 Programming in Java Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the Java Programming. The course includes Decision Making & Branching, Looping, Classes and Objects, Arrays, Multithreaded Programming.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Implement Core Java concepts.
CO2: Solve computational problems using various operators of Java.
CO3: Design solutions to complex by handling exceptions that may occur in the programs.
CO4: Solve complex and large problems using the concept of multithreading.
CO5: Implement interfaces and design packages.

List of Practical:

1. Write a Java program to compute area of 1) Circle2) rectangle 3) triangle 4) square.
2. Write a program to convert temperature from Fahrenheit to Celsius degree using Java.
3. Write a simple program in Java to print first fifty prime number.
4. Write a program in Java to print Fibonacci series in given series.
5. Write a Java program that prints current time in GMT.
6. Write a program in Java to demonstrate command line arguments.
7. Write a program in Java to create student information using array.
8. Program to remove the duplicate elements from an array.
9. Write a program in Java to demonstrate various operations on string functions.
10. Program to calculate area of Square and Rectangle using Method Overloading.
11. Program to calculate simple interest and compound interest using class.
12. Program to Encrypt and Decrypt the String using class.
13. Write a program in Java to implement default & parameterized constructor.
14. Write a program in Java to implement inheritance.
15. Write a program in Java to implement interface.
16. Write a program in Java to demonstrate wrapper classes
17. Write a program in Java to demonstrate abstract class.
18. Write a program in Java to implement user defined package.
19. Program to generate +ive Fibonacci and –ive Fibonacci series using Thread.
20. Program to implement Multiple Thread.
21. Applet Program to Displaying Digital COck. (Ex: 09:15:45 AM)
22. Applet Program to Draw different shapes and fill with different color, receives input from user.
23. Applet Program to Draw our National Flag.
24. Applet Program to display different image with different styles of font.
25. Applet Program to Draw Bar Charts with different colors.
26. Applet Program to draw Building with attractive colors.
27. Write a program in Java to demonstrate text stream object that take input from user & write it into text file.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks

	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT403: Database Management System

Credits: 4

LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the Introduction to Database Management System.

The course includes Components of DBMS Environment, Database System Architecture, Entity-Relationship Model, and Relational Data Model.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Analyze Data Base design methodology.

CO2: Acquire knowledge in fundamentals of Data Base Management System.

CO3: Analyze the difference between traditional file system and DBMS.

CO4: Design a database for a given set of requirements.

Course Content

UNIT I

Basic Concepts: Data, Information, Records and files. Traditional file –based Systems-File Based Approach-Limitations of File Based Approach, Database Approach-Characteristics of Database Approach, Database Management System (DBMS), Components of DBMS Environment, DBMS Functions and Components, Advantages and Disadvantages of DBMS. Roles in the Database Environment, Data and Database Administrator, Database Designers, Applications Developers and Users.

UNIT II

Database System Architecture: Three Levels of Architecture, External, Conceptual and Internal Levels, Schemas, Mappings and Instances. Data Independence, Logical and Physical Data Independence. Classification of Database Management System Centralized and Client Server architecture to DBMS. Data Models: Records- based Data Models, Object-based Data Models, Physical Data Models and Conceptual Modeling.

UNIT III

Entity-Relationship Model: Entity Types, Entity Sets, Attributes Relationship Types, Relationship Instances and ER Diagrams. Basic Concepts of Hierarchical and Network Data Model.

UNIT IV

Relational Data Model: Brief History, Relational Model Terminology-Relational Data Structure, Database Relations, Properties of Relations, Keys, Domains, Integrity Constraints over Relations, Base Tables and Views.

Recommended Books / Suggested Readings:

1. Desai, B.C., 1993: An Introduction to Database Systems, Galgotia Publ. Private Ltd.
2. Elmasri & Navathe, “Fundamentals of Database Systems”, 5th edition, Pearson Education.
3. Thomas Connolly Carolyn Begg, “Database Systems”, 3/e, Pearson Education.
4. C. J. Date, “An Introduction to Database Systems”, 8th edition, Addison Wesley N. Delhi.
5. Mukhi, Vijay 1992: Mastering Oracle 6.0, BPB Publications.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks

End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT423: Database Management System Lab

Credits: 2

LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the Introduction to Database Management System.

The course includes SQL Fundamentals, Joins, Queries, Tables.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Discuss about SQL Fundamentals.

CO2: Describe the Database connectivity with front-end.

CO3: Implement Commit & Rollback commands.

CO4: Describe the concepts of Table View, Log & Triggers.

List of Practical:

1. To implement Data Definition language
   - 1.1. Create, alter, drop, truncate
   - 1.2. To implement Constraints.
   - 1.2.1. (a). Primary key, (b). Foreign Key, (c). Check, (d). Unique, (e). Null, (f). Not null, (g). Default, (h). Enable Constraints, (i). Disable Constraints (j). Drop Constraints
2. To implementation on DML, TCL and DRL
   - 1.1. (a). Insert, (b). Select, (c). Update, (d). Delete, (e). commit, (f). rollback, (g). save point, (i). Like'%', (j). Relational Operator.
3. To implement Nested Queries & Join Queries
   - 1.1 a). To implementation of Nested Queries
   - 1.2 (b). (a) Inner join, (b). Left join, (c). Right join (d). Full join
4. To implement Views
   - 3.1. (a). View, (b). joint view, (c). force view, (d). View with check option

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT528: Minor Project
Credits: 1
LTP 002

Course Description: The course aims to equip the students with practical application of IT principles for designing, fabrication and testing of working models.
The course includes SDLC, Project Management.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the team working and team management.
CO2: Discuss how to develop components & systems in isolation which meets a common goal.
CO3: Discuss about practical application of engineering principles for designing, fabrication and testing of working models.
CO4: Design a system, model, component or a process to meet desired/industrial/R&D needs.

Guidelines for Minor Project
The minor project is considered as a steppingstone in implementing Major projects. Hence students should plan and organize their minor projects meticulously and necessary discussions and planning should be done so as to achieve this objective. The following guidelines should be adhered to:

1. Team size should preferably be two with a maximum limit of 3 members.
2. Individual projects may be permitted.
3. Minor Projects should be purely internal in nature.
4. No restriction on tools/platform/language chosen should be made.
5. Students must ensure that they have to submit their synopsis of Project within 30 days from the start of the project.
6. Two interim reports (one after analysis and another after design) should be submitted to internal guides.
7. The number of records to be submitted is limited to team size + one (Departmental copy). Hard binding of reports is mandatory.
8. The report format guidelines used to document Minor Projects should be followed for making the final report and evaluation will be made on the same grounds.

Evaluation of Minor Project:
External Evaluation:
Criteria for external evaluation of Minor Project, External evaluation is done by an external examiner appointed by the HOD/DEAN of the department. The following components are to be assessed for the End Semester External Evaluation of the Minor Project:

Project Demonstration	20 marks
Presentation	20 marks
Viva -voce	20 marks
Total marks	60 marks

Internal Evaluation:
Criteria for internal evaluation of Minor Project, Internal evaluation is being done by conducting a Viva by a team of evaluators comprising of the concerned guides and/or Head of the Department. The following are the components for internal evaluation of the Minor Project:

Presentation /Internal Viva	10 marks
Individual involvement & teamwork	10 marks
Attendance	5 marks
Project Report	15 marks
Total marks	40 marks

BIT629: Major Project
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a professional environment and/or style typical of a global IT industry.
The course includes Project feasibility, Process Modelling, System Design, Program design, Program coding and unit testing, System integration, System implementation and acceptance testing.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Apply new technologies & design techniques (platform, database, etc.) concerned for devising a solution for a given problem statement.
CO2: Develop components & systems in isolation which meets a common goal.
CO3: Apply project management skills (scheduling work, procuring parts and documenting Expenditures and working within the confines of a deadline).
CO4: Prepare a technical report based on the Major project.

Guidelines for Major Project
Hence students should plan and organize their minor projects meticulously and necessary discussions and planning should be done so as to achieve this objective. The following guidelines should be adhered to:

1. Group Size: Maximum 4, most preferably:3.
2. Certificate should include the names of all members.
3. The minimal phases for the project are: Project feasibility, Investigation of system requirements, Data and Process Modelling, System Design, Program design, Program coding and unit testing, System integration, System implementation and acceptance testing.
4. A Major Project consist of Formulation of Groups, problem identification in IT field, defining objectives and methodology to be used in carrying out project work which will add value to society and knowledge based of Information technology.
5. In Major project, students are developing the project based on the ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, IT field, academic institutions and research laboratories.
6. Students must ensure that they have to submit their synopsis of Project within 15 days from the start of the project.
7. Two interim reports (one after analysis and another after design) should be submitted to internal guides.
8. The number of records to be submitted is limited to team size + one (Departmental copy). Hard binding of reports is mandatory.
9. The report format guidelines used to document Major Projects should be followed for making the final report and evaluation will be made on the same grounds.
10. **Typing Instructions for Major Project Report:**
    - Specification for Fonts:
    - Font Face: Times new Romano.
    - Font Size: As per following preview:
        - Headings (Size 16 Bold).
        - Sub-Heading (Size 14 Bold and Italic).
        - Contents (Size 12Normal)
        - Line spacing: 1.5.
        - Text Alignment: Both left and right justified.
    - Page Dimensions: Standard A4 size (297mm x 210mm).
    - Margins:
        - Top margin: 0.75”
        - Bottom margin: 0.75”
        - Left margin: 1”
        - Right margin: 0.75”
    - Footer: Page number should be bottom centered.
    - Sections should be numbered as for example,1. Introduction.
    - Subsections should be numbered as for example,3.1 Simulation Toltec.

- Paragraphs and sentences should be short.
- Start of a paragraph should not be intended, rather, give one-line space between two paragraphs.
- A sub heading at the bottom of a page must have at least two full lines below it or else it should be carried over to the next page.
- The last word of any page should not be split using a hyphen.
- References:
  - Book titles must be in capitals.
  - Reference numbers should be marked liberally inside the text of the report-e.g., ...as given in [3].
  - References should either be in chronological order or in the order in which they appear in the text.

Evaluation of Major Project:

External Evaluation:

Criteria for external evaluation of Major Project, External evaluation is done by an external examiner appointed by the HOD/DEAN of the department. The following components are to be assessed for the End Semester External Evaluation of the Minor Project:

Project Demonstration	20 marks
Presentation	20 marks
Viva -voce	20 marks
Total marks	60 marks

Internal Evaluation:

Criteria for internal evaluation of Major Project, Internal evaluation is being done by conducting a Viva by a team of evaluators comprising of the concerned guides and/or Head of the Department. The following are the components for internal evaluation of the Minor Project:

Presentation /Internal Viva	10 marks
Individual involvement & teamwork	10 marks
Attendance	5 marks
Project Report	15 marks
Total marks	40 marks

BIT850: Research Project
Credits: 4
LTP 008

Course Description: The course aims to equip the students to provide an opportunity to apply the knowledge gained through various courses in solving a research problem.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Articulate a clear research question or problem
CO2: Define, articulate and use terminology, concepts, and theory in their field and know how to use them.
CO3: Apply problem solving skills to constructively address research on computer science problem.
CO4: Design a system, model, component or a process to meet desired/industrial/R&D needs.

Guidelines for BCA Research Project

Project Course shall be evaluated for 200 marks, out of which, 80 marks shall be for Sessional Evaluation and 120 marks for the End Examination (Viva–Voce). Every student shall be required to submit a research project synopsis on a topic approved by the Department Project Review Committee (DPRC).

1. A DPRC shall be constituted with the Dean/Head of the Department, Supervisor and two senior faculty members.
2. A student has to submit area of interest to the Coordinator in the 1st week of commencement of the Semester.
3. Class Coordinator has to collect area of interest from students and the faculty. He/she has to allot the guide in consultation with HOD. The priority will be given based on the performance of the student in the examinations conducted till date.
4. A student has to submit, in consultation with his project supervisor, the title, abstract and plan of action of his project work before DPRC for approval. The student can initiate the Project work, by obtaining the approval from the DPRC. The project duration is for the semester.
5. If a student wishes to change his supervisor or topic of the project, he can do so with the approval of the DPRC. However, the DPRC shall examine whether or not the change of topic / supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
6. A student shall submit his status report with at least 2 reviews per Semester conducted by the DPRC.
7. The Sessional Evaluation shall be made on the basis of reviews and on the progress of the work evaluated by DPRC.
8. Two copies of the Project report certified by the supervisor and HOD shall be submitted to the Department after getting plagiarism check (Similarity index should be less than 15%).
2. The external examiner shall be appointed by the Dean/HOD.

Organization of Research Project Report

1. Title page
2. Certificate
3. Certificate issued by outside organization (if any)
4. Acknowledgements
5. Abstract
6. Index
7. List of Figures
8. List of Tables
9. Body of the Research Project Report as follows:

1. Introduction to the problem
2. State of the Art/Literature Survey
3. Present Work with diagrams
4. Implementation
5. Results along with test cases
6. Conclusions and Future Work
7. Bibliography/References
8. Appendix - I

Guidelines

• Every copy should be accompanied by a softcopy in CD along with required software and tools
• No. of copies are 03(three) 1 for Department, 1 for Library and 1 copy for student.

The following should be used for thesis preparation

. Black cover with Gold printing should be used for binding.
a. A4 executive bond paper should be used.
b. Page No's should be in the centre with font size 11 and font style Times New Roman.
c. A margin of 3.75 cm (1½ inch) is to be given on the binding edge while on the other sides it is to be 2.5 cm (1 inch).
d. All the text should be in Times New Roman style with 1.5 paragraph spacing.
e. Chapter Names – Size 16 Bold
f. Topics of Chapter – Size 14
g. Sub Topics – Size 12
h. Any Other text – Size 11

BIT529: Industrial Training
Credits: 2

Course Description: The course aims to equip the students with a professional environment and/or style typical of a global IT industry.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
CO2: Describe use of advanced tools and techniques encountered during industrial training.
CO3: Participate in the projects in industries during his or her industrial training.
CO4: Prepare professional work reports and presentations.

Course Contents:

Summer Professional Training is an important part of BSc (IT) course curriculum. It provides an opportunity to BSc (IT) students to write a summer training report on latest trends/technology related to software project. Following are guidelines for summer training report writing and assessment:

General Instructions:

1. Summer training report should not be less than 50 pages.
2. Proper guidelines to be followed for preparation of summer training report.
3. Proper dress code is mandatory for presenting and attending summer training PPT presentations.
4. Attendance is compulsory for all students.
5. If a student is absent for his presentation as per schedule, he/she must assess later on with reduced weightage in the presentation assessment.
6. Always prepare a draft report first and print it out.
7. Read it yourself first and correct any typographical or grammatical errors.
8. One copy of final summer training report must be submitted as a spiraled report to the coordinator.

Main Components of a Report:

2. Cover page.
3. Abstract
4. Acknowledgement and declaration.
5. Certificate.
6. Table of contents/Index page.
7. conclusions.
8. References.

Typing Instructions for Summer Training Report:

- Specification for Fonts:
- Font Face: Times new Romano.
- Font Size: As per following preview:
    - Headings (Size 16 Bold).
    - Sub-Heading (Size 14 Bold and Italic).
    - Contents (Size 12Normal)
    - Line spacing: 1.5.
    - Text Alignment: Both left and right justified.
- Page Dimensions: Standard A4 size (297mm x 210mm).
- Margins:
    - Top margin: 0.75”
    - Bottom margin: 0.75”
    - Left margin: 1”
    - Right margin: 0.75”
- Footer: Page number should be bottom centered.
- Sections should be numbered as for example,1. Introduction.
- Subsections should be numbered as for example,3.1 Simulation Toltec.
- Paragraphs and sentences should be short.
- Start of a paragraph should not be intended, rather, give one-line space between two paragraphs.
- A sub heading at the bottom of a page must have at least two full lines below it or else it should be carried over to the next page.

- The last word of any page should not be split using a hyphen.
- References:
  - Book titles must be in capitals.
  - Reference numbers should be marked liberally inside the text of the report-e.g., ...as given in [3].
  - References should either be in chronological order or in the order in which they appear in the text.

Internal/External Evaluation:

Criteria for Internal/external evaluation of Industrial Training, External evaluation is done by one external examiner and one internal examiner are appointed by the HOD/DEAN of the department. The following components are to be assessed for the End Semester External Evaluation of the Professional Training:

Training Report	25 marks
Presentation	20 marks
Training Viva	25 marks
Depth of knowledge and skills	15 marks
Quality of content presented.	15 marks
Total Marks	100 marks

Ability Enhanced Compulsory Courses (AECC)

COM101: **English Communication**
Credits: 2
LTP 200

Course Description: The course aims to equip the students with the use of English in everyday situations both in formal and informal contexts. The course includes reading skills, writing skills, Grammar and vocabulary.

Course Outcomes:

Upon successful completion of the course, the students should be able to:

CO1: Develop a minute practical knowledge about English grammar and its usage.

CO2: Develop an understanding of the importance of free expression**.**

Course Contents:

UNIT I

Reading Skills: Comprehension of Unseen Passage [Reading articles] (Intermediate) Summary Paraphrasing, Translation and Precis Writing.

UNIT II

English Grammar and Usage: Parts of speech, common errors in writing (based on Parts of Speech) Tenses, Change of Voice, Transformation of Sentences.

UNIT III

Basic Writing Skills and Writing Practices: Paragraph/essay writing, short life story writing, Notice (General like trip, change of name, function) making notes and Letter writing.

UNIT IV

Vocabulary Enhancement: Synonym, Antonym, Idioms and Phrasal verbs

Reference Book:

1. *Practical English Usage.* Michael Swan OUP. 1995

Suggested Readings:

1. *On Writing Well. William* Zinsser. Harper Resource Book. 2001
2. *Communication Skills*. Sanjay Kumar and PushpLata. Oxford University Press. 2006
3. *Exercises in Spoken English.* CIEFL, Hyderabad. Oxford University Press

Internet Links:

1. https://www.englishgrammar101.com/
2. http://learnenglish.britishcouncil.org/en/english-grammar
3. http://www.englishgrammarsecrets.com/
4. http://www.myenglishpages.com/
5. http://www.english-for-students.com/Homonyms-B.html

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	15 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

COM121: English Communication Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with focus on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts. The course includes description of sights seen in everyday life, pronunciation of different words and its correct usage.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Develop better understanding of nuances of English language through audio- visual experience and group activities

CO2: Hone speaking skills with clarity and confidence

CO3: Have better comprehension of accent of people of different backgrounds and regions

CO4: Use English grammar accurately

Course Content

UNIT I

Daily Discourse: Common Everyday Situations: Conversations and Dialogues (Unit 1-6), Monologue (2D/4D/5D/6D), and Communication at workplace

UNIT II

Listening Skills: Listening skills on Social Interactions (Unit 1), work and study (Unit 2), daily life (Unit 3), food (Unit 4), Places (Unit 5) and Family (Unit 6)

UNIT III

Phonetic Skills: Pronunciation, Intonation, Stress (Unit 1-6) and Rhythm

UNIT IV

Speaking Skills: Group Discussion / Debate, Role Plays

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal viva	15 Marks
	Attendance	5 Marks
External Assessment (Summative)	External Viva	30 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

ENS001: Environmental Studies

Credits: 2

L T P

2 0 0

Course Description: This course deals with the environment components, ecosystems and how to maintain equilibrium in nature, its conservation, and different methods to reduce pollution and maintain our nature.

Course Outcomes (CO): After completion of this course, student will be able to

CO1: Understand about environment, its role and importance for living beings.

CO2: Understand the structure of ecosystem, food chain/ web.

CO3: Understand about the natural resources and their uses.

CO4: Understand about different types of pollution created by human beings and their side effects as well as the methods to reduce these pollutions and their alternatives.

UNIT I

Introduction to environmental studies: Multidisciplinary nature of environmental studies; components of environment –atmosphere, hydrosphere, lithosphere and biosphere, Scope and importance; Concept of sustainability and sustainable development.

UNIT II

Ecosystems: What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT III

Natural Resources:

Renewable and Non-renewable Resources: Land Resources and land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Heating of earth and circulation of air; air mass formation and precipitation.

Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT IV

Biodiversity and Conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India**,** Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT V

Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution**,** Nuclear hazards and human health risks**,** Solid waste management: Control measures of urban and industrial waste, Pollution case studies.

UNIT VI

Environmental Policies & Practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC). Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context

UNIT VII

Human Communities and the Environment: Human population and growth: Impact on environment, human health and welfares.**,** Carbon footprint.**,** Resettlement and rehabilitation of project affected persons, case studies. Disaster management: floods, earthquakes, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnoi's of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in

environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

UNIT VIII

Field work: Visit to an area to document environmental assets; river/forest/flora/fauna, etc.**,** Visit to a local polluted site -Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds and basic principles of identification, Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Suggested Readings:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., &Guha, R.1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P.1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, h.T. & Andrews, J.1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. &Datta, A.K. 1987. Wastewater Treatement. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M.L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003.Ecology and economics: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C.E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E.O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
20. World Commission on environment and Development. 1987. Our Common Future. Oxford University Press.
21. 21.www.nacwc.nic.in
22. 22.www.opcw.org

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

COM201: Business Communication

Credits: 2

LTP 200

Course Description: The course aims to equip the students with business communication principles. The course includes designing and mastering the most important communication skills, from professional writing presentations.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Develop effective reading and writing skills.

CO2: Understand the vocabulary and technical jargons as used in business communication.

Course Contents:

UNIT I

Theory of Communication: Process of Communication, Verbal and Non-verbal communication, Modes of Communication, and Barriers to Communication.

UNIT II

Nature and Style of sensible Writing: Memorandum, Notices, Quotations/Tenders, Report Making, Minutes of Meeting, E-Mail, Press Note, Resume, Complaint Letter, Inquiry Letter, Cover Letter, Confirmation Letter, Resignation Letter, Permission Letter and Job Application.

UNIT III

Vocabulary Building: Words Often Confused and Words Often Misspelt, standard abbreviations, word formation, prefix, suffix, root words from foreign languages, punctuation, phrases, and clauses

Unit IV

Grammar: Conditional Sentences, and Degrees of Comparison

Reference Book: Cambridge English Empower Elementary Student's Book by Cambridge University Press

Recommended Books / Suggested Readings:

1. *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
2. *Study Writing.* Liz Hamp-Lyons and Ben Heasly, Cambridge University Press.2006.
3. *On Writing Well. William* Zinsser. Harper Resource Book. 2001
4. *Practical English Usage. Michael Swan. OUP. 1995.*

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	15 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

COM221: Business Communication Lab

Credits: 1

LTP 002

Course Description: The course aims to equip the students with business communication principles through creation of effective business and oral presentations. Includes study and application of team communication and use of technology to facilitate the communication. The course includes designing and mastering the most important communication skills, from professional writing presentations.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Acquire in-depth knowledge of principles of *business communication.*

CO2: Discuss the use of video in business messages**.**

CO3: Deliver high-quality oral presentations.

CO4: Develop Nonverbal communication, interview preparation and resume writing.

Course Content

UNIT I

Listening Skills: Listening Exercises on Journeys (Unit 7), Fit and healthy (Unit 8), Clothes and shopping (Unit 9), Communication (Unit 10), Entertainment (Unit 11) and Travel (Unit 12)

UNIT II

Presentation Skills**:** Making PPT and Presenting Power Point Presentation

UNIT III

Phonological Skills**:** Pronunciation, syllables and word stress

UNIT IV

Speaking Skills: Interview skills

Recommended Books / Suggested Readings:

1. Cambridge English Empower Elementary Student's Book by Cambridge University Press
2. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
3. Study Writing. Liz Hamp-Lyons and Ben Heasly, Cambridge University Press.2006.
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Practical English Usage. Michael Swan. OUP. 1995.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Internal viva	15 Marks
	Attendance	5 Marks
External Assessment (Summative)	External Viva	30 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

HVPE101: Human Values & Professional Ethics
Credits: 2
LTP 2 0 0

Course Description: The course aims to equip the students to understand the need, basic guidelines, content and process of value education. This course includes harmony at all the levels of human living, and harmony in existence in their profession and lead an ethical life.

Course Outcomes (CO):

Upon the successful completion of the course, student will be able to:

CO1: Understand the significance of value inputs in a classroom, distinguish between values and skills

CO2: Compare between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body

CO3: Compare between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

CO4: Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.

Course Contents:

UNIT-1

Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Happiness and Prosperity -Current Scenario.

UNIT-II

Harmony in the Human Being: Understanding Human being as the Co-existence of self ('I') and the Body, discriminating between the Needs of the Self ('I') and the Body, Understanding Harmony in the self ('I'), Harmony of the self ('I') with the Body.

UNIT-III

Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' - the Foundational Value in Relationships, Understanding, Harmony in the Society.

UNIT-IV

Harmony in the Nature (Existence): Understanding Harmony in the Nature, Interconnectedness, Self-regulation and Mutual Fulfillment among the Four Orders of Nature, The Holistic Perception of Harmony in Existence.

Implications of the Holistic Understanding -a Look at Professional Ethics: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Strategies for Transition towards Value-based Life and Profession.

Suggested Readings:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics
2. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Suggested Books:

1. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
2. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

GWE101: Gender Equality and Women Empowerment
Credits: 2
LTP 200

Course Description: Course Description: The course aims to equip the students to provide the knowledge around the revolving issues for gender equality and women's empowerment. The course includes the issues of gender and the gender inequalities prevalent in society, Women and Law and Prevention of Sexual Harassment.

Course Outcomes (CO):

Upon the successful completion of the course, student will be able to:

CO1: Recognize the intersections between gender and other social and cultural identities

CO2: Engage in promoting social justice and human rights

CO3: Explain how theories of gender and sexuality have been influenced by and influence their social contexts

CO4: Describe the social construction of gender and sexuality and explain who these constructions are shaped by the time, location, and culture.

Course Contents:

UNIT-1

Introduction to Women's Studies: Sex and Gender, socialization, Definition, Nature, Scope and various dimensions.

UNIT-2

Approaches of Feminism: Feminism and Patriarchy, Feminist ideology, Feminist Movements in brief.

UNIT-3

Basic concepts of Gender and Society: Sexual division of Labor, Masculinity & feminity, Man and Woman relationship, Self-awareness, consciousness raising.

UNIT-4

Women and Law: Constitutional Laws and Fundamental rights, Human Rights, Women related Law, Women in Politics

UNIT-5

Skill development and presentation: Film/Documentary Screening, Field Visits, Group discussion and debate, Awareness Songs, Street plays, theatre and presentation skills for personality development**.**

UNIT-6

Prevention of Sexual Harassment: Preconditions for Effective Working of Sexual Harassment, Complaints Committees, Role of men in prevention of sexual harassment at workplace, Gender sensitive language, work culture and workplace.

Recommended Books / Suggested Readings:

1. Gill, Rajesh, Contemporary Indian Urban Society- Ethnicity, Gender and Governance, Bookwell Publishers, New Delhi,2009.
2. Jain, Devaki and Rajput, Pam, (eds), Narratives from the Women's Studies Family, Sage, New Delhi,2003.
3. Mies, Maria, Indian Women and Patriarchy, Concept Publishing Company, New Delhi, 2004.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks

End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

Vocational Courses (VC)

BIT106: HRM for IT Manager
Credits: 3
LTP 3 0 0

Course Description: The course aims to equip the students with the techniques and principles to manage human resource of an organization and focused on Indian experiences, approaches and cases. The course includes focuses on changing environment of HRM, Human Resource Planning, Human Resource Information System (HRIS), Job analysis, Recruitment and Selection & Training & development, Performance appraisal, it deals with issues related to people such as compensation, Industrial Disputes, Industrial Relations and trade unions.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the concept of Human resources management.
CO2: Discuss the development, implementation, and evaluation of employee recruitment, selection, and job analysis
CO3: Develop, implement, and evaluate employee training and development programs
CO4: Describe various industrial disputes, trade unions, and social security measures.
Course Contents

UNIT I

Human Resource Management: Concept, Nature, scope, managerial and operative functions of Human resource management, roles, skills & competencies of HR Manager, HRD definition, goals and functions; The changing environment of HRM – globalization, cultural environment, technological advances, workforce diversity, corporate downsizing, changing skill requirement.

UNIT II

Human Resource Planning: Process, forecasting demand & supply, Skill inventories, Human Resource Information System (HRIS), introduction to succession planning, Job analysis – Uses, methods, process, Job description & Job specifications. Concept of Job Design, Recruitment and Selection: internal & external sources, e- recruitment, selection process.

UNIT III

Training: Concept, Need, and importance of training, on the job and off the job Methods of training, Performance appraisal: concept, uses of performance appraisal, Traditional and Modern methods of performance appraisal, factors that distort appraisal, appraisal interview, Concept of Career planning, objectives of career planning.

UNIT IV

Compensation: Steps of determining compensation, components of pay structure, factors influencing compensation levels, Brief introduction of social security, health, retirement & other benefits, Industrial Relations: Introduction to Industrial Relations, industrial dispute- concept, causes & machinery for settlement of disputes, Trade unions role, types, functions, problems.

Recommended Books / Suggested Readings:

1. De Cenzo, D.A. & Robbins: Fundamentals of Human Resource Management, New York: John Wiley & Sons.
2. Dessler, G: Human Resource Management, Pearson.
3. Monappa & Saiyaddin: Personnel Management, Tata McGraw Hill.
4. Rao, V.S.P.: Human Resource Management- Text and Cases, Excel Books.
5. R. Wayne Mondy & Rober M. Noe: Human Resource Management, Pearson.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT105: MANAGERIAL ECONOMICS- I
Credits: 3
LTP 3 0 0

Course Description: The objective of the paper is to acquaint the students with the economic concepts and principles and to enable them to use them to address business problems in a globalized economic environment.

Course Outcomes: After completing this course students shall be able to:

CO1: To understand the measurement of price elasticity of demand, determinants of elasticity and apply the concepts of price, cross and income elasticity of demand.

CO2: To assess the position of a company and explain the concepts of factors of production, collective bargaining and the underlying theories of factors of production.

CO3: Recognize the relationship between short-run and long-run costs and will also be able to establish the linkage between production function and cost function

CO4: Compare and contrast four basic types of market i.e. perfect, monopoly, monopolistic and oligopoly and can determine price and output under different market types.

UNIT-I

Introduction to Managerial Economics: Managerial Economics: Meaning, Nature, Scope & Relationship with other disciplines, Role of managerial economics in decision Making, Scarcity Concept. Demand: Demand and its Determination: Demand function; Determinants of demand; Demand elasticity – Price, Income and cross elasticity, Use of elasticity for analyzing demand. Demand forecasting: Introduction and techniques.

UNIT-II

Indifference Curve Analysis: Meaning, Assumptions, Properties, Consumer Equilibrium, Importance of Indifference Analysis, Limitations of Indifference Theory Production Function: Meaning, Concept of productivity and technology, Short Run and long run production function, Introduction to Isoquants; Least cost combination of inputs, Producer's equilibrium; Returns to scale.

UNIT-III

Theory of Cost: Cost Concepts and Determinants of cost, short run and long run cost theory, Modern Theory of Cost, Relationship between cost and production function Revenue Curve: Concept of Revenue, Different Types of Revenues, concept and shapes of Total Revenue, Average revenue and marginal revenue, Relationship between Total Revenue, Average revenue and marginal revenue, Elasticity of Demand and Revenue relation

UNIT-IV

Market Structure: Market Structure: Meaning, Assumptions and Equilibrium of Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly: Price and output determination under collusive oligopoly, Price and output determination under non-collusive oligopoly. Supply: Introduction to supply and supply curve. Pricing: Pricing practices; Commodity Pricing: Economics of advertisement costs; Types of pricing practices. Note: Relevant Case Studies will be discussed in class.

Recommended Books / Suggested Readings:

1. D. M. Mithani, Managerial Economics Theory and Applications, Himalaya Publication

2. Peterson and Lewis, Managerial Economic, Prentice Hall of India
3. Gupta, Managerial Economics, Tata McGraw Hills
4. Geetika, Managerial Economics, Tata McGraw Hills
5. D.N.Dwivedi, Managerial Economic, Vikas Publications
6. Koutsoyiannis, A Modern Micro Economics, Palgrave Macmillan Publishers, New Delhi.
7. H. L Ahuja Advanced Economic Analysis, S. Chand & Co. Ltd, New Delhi.
8. G.S Gupta, Managerial Economics, Tata McGraw Hill.
9. K.K .Dewett, Modern Economic Theory, S. Chand Publication

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

CAM101: Digital Design
Credits 3
LTP
300

Course Description: The course aims to equip the students with detailed understanding of Photoshop's role in digital media.

The course includes principles of design, Basic to advanced photo editing techniques used in industry.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Work with digital graphics and color compositions.

CO2: Create logical and aesthetical digital designs.

CO3: Describe various techniques of creating matte paints.

CO4: Create magazine covers and promotional material.

Course Content

UNIT I

Principles of design: Balance, Proportion, Rhythm, Harmony and unity, Emphasis.

UNIT II

Photoshop: Introduction to digital art and platform, Pixel, Raster, Vector, Bit depth, Resolution**. User Interface**: Basic setting and color, Canvas. **Working with Layers and Tools:** Layer management, understanding menu bar, retouching photo and images, Text, understanding tool bar, Understanding channels, Layer mask, Quick mask tool. **Composition and Color Correction:** Understanding compositing, Color correction tools and techniques.

UNIT III

Digital& Matte Painting: Understanding Digital painting, Tools and techniques of digital painting. Understanding concept of Matte painting, Tools and techniques of matte painting**.**

UNIT IV

Filter and Effects: Working with various filters and effects used in Photoshop for different kind of project work.

Recommended Books / Suggested Readings:

1. Lidwell William, (January 1, 2010), Universal Principles of Design, Rockport Publishers.

2. Mark Galer and Philip Andrews, (26 July 2012), Adobe Photoshop CC Classroom in a Book (2018 release), Focal Press; Pap/DVD edition.

3. Kevin Musk (3 October 2021), Digital Matte Painting Kindle Edition.

Course Assessment Pattern:

Criteria	Description	Maximum Marks

Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BAM102: Digital Illustration and Image Processing

Credits: 3
LTP 300

Course Description: The course aims to equip the students' knowledge about the principles of design and their implementation in digital design.
The course includes understanding difference between raster and vector graphics and practical experience of creating Digital paintings using Adobe Photoshop and Illustrator.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:

CO1: Know about digital graphics and color compositions.

CO2: Use Illustrator tools to create logical and aesthetical vector designs.

CO3: Learn various techniques of creating matte paints.

CO4: Create magazine covers and promotional material.

Course Content

UNIT I

Principles of design: Balance, proportion, Rhythm, Harmony and unity, Emphasis.

UNIT II

Vector Graphics Designing: (Character Creation) Introduction to Illustrator, Introduction to User Interface, Understanding tools, Working with Image and Shapes Manipulation, Selecting and Aligning, grouping, Exploring object arrangement, working with nested group, Creating and Editing Shapes, Understanding Drawing modes, Joining Paths, Using Image Trace to create Shapes, Transforming objects, Working with Color and Pencil Tools, drawing with the Pencil tools, Path finding & Graphics type panels, Painting with Patterns, Working with Live Paint, Understanding the Perspective Grid, Preset Grid, Active Grid, Understanding Symbols, Illustrator Symbols Library, Creating and Editing Symbols

UNIT III

Raster Graphics Designing- Photo manipulation, restoration, concept art- Introduction to Photoshop, digital art and platform, pixel, Raster, vector, Bit depth, Resolution, working with layers and tools, Layer management, understanding menu bar, retouching photo and images, Text, understanding tool bar, understanding channels, Layer mask, Quick mask tool, Composition and Color Correction, Understanding compositing, Color correction tools and techniques.

UNIT IV

Matte Painting & Digital Painting: Understanding Digital painting, Tools and techniques of digital painting, concept of Matte painting, Tools, and techniques of matte painting, Understanding various filters and effects. Using Layers to create depth in a matte painting. Using various tool to re-touch and restore an old image. Color grading an image. Brush patterns and creating brushes in photoshop.

Recommended Books / Suggested Readings:

1. Lidwell, William, (October 1, 2003), Universal Principles of Design, Rockport Publishers.
2. Adobe Photoshop Classroom in a Book, 3 February 2021 by Conrad Chavez (Author), Andrew Faulkner (Author)
3. Mattingly, David B, (8 April 2011), The Digital Matte Painting Handbook, Sybex; Pap/Dvdr edition.
4. Adobe Creative Team, (July 5, 2013), Adobe Illustrator CC: Classroom in a book, Adobe Press; 1 Edition

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT313: E-Commerce
Credits: 3
LTP 300

Course Description:
The course aims to equip the students with

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the basic business management concepts.
CO2: Discuss about basic technical concepts relating to E-Commerce.
CO3: Discuss about the security issues, threats and challenges of E-Commerce.
C**O4:** Describe the E-Payment Systems.

Course Content

UNIT - I

E-commerce in Indian Business Context: E-Commerce, Emergence of the Internet, Emergence of the WWW, Advantages of E-Commerce, Transition to E-Commerce in India, The Internet and India, E-transition Challenges for Indian Corporate. Business Models for Ecommerce: Business Model, E-business Models Based on the Relationship of Transaction Parties - E-business Models Based on the Relationship of Transaction Types.

UNIT – II

Technologies of the World Wide Web: World Wide Web, Internet Client-Server Applications, Networks and Internets, Software Agents, Internet Standards and Specifications, ISP. **E-Marketing**: Traditional Marketing, Identifying Web Presence Goals, Online Marketing, E-advertising, E-branding.

UNIT - III

E-Security: Information system Security, Security on the Internet, E-business Risk Management Issues, Information Security Environment in India**. Legal and Ethical Issues**: Cybers talking, Privacy is at Risk in the Internet Age, Phishing, Application Fraud, Skimming, Copyright, Internet Gambling, Threats to Children.

UNIT - IV

E-Payment Systems: Main Concerns in Internet Banking, Digital Payment Requirements, Digital Token-based e-payment Systems, Classification of New Payment Systems, Properties of Electronic Cash, Cheque Payment Systems on the Internet, Risk and e-Payment Systems, Designing e-payment Systems, Digital Signature, Online Financial Services in India - Online Stock Trading, **Information systems for Mobile Commerce**: Mobile Commerce, Wireless Applications, Technologies for Mobile Commerce, Security Issues Pertaining to Cellular Technology.

Recommended Books / Suggested Readings:

1. P.T.Joseph, S.J., “E-Commerce - An Indian Perspective”, PHI 2012, 4th Edition
2. David Whitely, “E-Commerce Strategy, Technologies and Applications”, Tata McGraw Hill, 2001.
3. Ravi Kalakota, Andrew B Whinston, “Frontiers of Electronic Commerce”, Pearson 2006, 12th Impression.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT314: Office Automation
Credits: 3
LTP 300

Course Description:
The course aims to equip the students with crafting professional excel spread sheets, MS Access using the Microsoft suite of office tools. This course includes Excel basics, Excel Charts, Graphics and Functions.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the Office Automation tools.
CO2: Perform accounting operations
CO3: Discuss the fundamentals of MS Access.
CO4: Describe the E-mail and Internet Services and Business in the online world.

Course Content

UNIT I

Excel basics: The usual spread sheet features, Overview of excel features, Getting Started, Creating a new work sheet, Selecting cells, Navigating with the mouse and keyboard, Entering and editing text, text boxes, text notes, checking spelling, undoing and repeating actions, entering and formatting numbers, entering and editing formulas, referencing cells, order of evaluation in formulas, look up tables, copying entries and equations to minimize typing, more auto fill examples, creating custom fill lists, protecting and un protecting documents and cells.
Rearranging worksheets: Moving cells, copying cells, sorting cell data, inserting rows, inserting columns, inserting cells, inserting as you paste, deleting parts of a worksheet, clearing parts of a worksheet, how formulas react to worksheet design changes, Auditing tools help spot potential problems.

UNIT II

Excel Charts, Graphics and Functions: Excel's chart features: chart parts and terminology, instant charts with the chart wizard, creating charts on separate worksheets, resizing and moving charts, adding chart notes and arrows, editing charts, rotating 3-D charts, changing worksheet values by dragging chart parts, printing charts, deleting charts, setting the default chart type, controlling which series on which axis, adding overlay charts, creating trend lines, data map.
Working with graphics in Excel: Creating and placing graphic objects, resizing graphics, positioning graphics on worksheets, drawing lines and shapes, examples of graphics in Excel, possible sources of excel graphics, Excel slide shows.

UNIT III

MS Access Basics: Introduction to Access: Access concepts and terms, starting and quitting access, the access workspace and tools, the views. **Creating a simple database and tables**: The access table wizard, creating databases without the wizard, field names, data types and properties, adding or deleting fields in tables, renaming fields and their captions, moving fields, deleting fields in tables, resizing fields, changing the appearance of text in tables, freezing columns, primary key fields, indexing fields, viewing a list of database properties.

UNIT IV

Fundamentals of Internet: E-mail and Internet Services: Overview: communicating through the Internet, Using Email, Using an E-mail program, stomping out spam, Using web-based e-mail services. Connecting to the Internet, Connecting to the Internet on wired and wireless. **Business in the online world**: Overview: commerce on the world wide web, Ecommerce at the consumer level, E-commerce at the business level, Telecommuters.

Recommended Books / Suggested Readings:

1. Ron Mansfield, Working in Microsoft office, Tata McGraw Hill (2008) (chapters 13 to 23 and 29 to 38)
2. Peter Norton, Introduction to computers, Sixth Edition Tata McGraw Hill (2007) (Chapters 8A, 8B, 9A, 9B).

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT412: Fundamental of Digital Marketing

Credits: 3

LTP 300

Course Description: The course aims to equip the students with knowledge of Internet Marketing topics including online advertising, search, social media, and online privacy.

Course Outcomes (CO)

Upon successful completion of the course, the students should be able to:

CO1: Develop understanding of the processes and techniques of digital marketing.

CO2: Assess the challenges and the opportunities of digital marketing.

CO3: Evaluate future trends in digital marketing.

CO4: Describe the different types of marketing in the Digital Marketing.

Course Content

UNIT I

Introduction to Digital Marketing: Difference between Traditional Marketing and Digital Marketing, Benefits of using Digital Media, Inbound and Outbound Marketing, Online marketing POEM: (Paid, Owned, and Earned Media), Components of Online Marketing (Email, Forum, Social network, Banner, Blog), Impact of Online Marketing, Basics of Affiliate Marketing, Viral Marketing, Influencer Marketing, Referral Marketing.

UNIT II

Search Marketing: Basics of Search Marketing, organic and paid search results, Overview of Google AdWords, keyword research and analysis, Search Engine Optimization techniques: on-page optimization and off-page optimization. Web Analytics: Digital measurement landscape, introduction to Google Analytics, interpreting the data in Google Analytics.

UNIT III

Social Media Marketing: Different social media channels, social media for various businesses: B2C and B2B, measuring social media ROI, Content Marketing: Storytelling in social media. Email Marketing: Basics of email marketing. Concept of A/B testing and its use in email marketing.

UNIT IV

Display and Mobile Marketing: Display Marketing: different kinds of display marketing, display marketing ecosystem, retargeting and dynamic retargeting. Mobile Marketing: different kinds of mobile marketing, the mobile market ecosystem.

Writing for Digital Marketing: Identify the readers, understand the needs of your users, understand the context of use, and understand the business objectives, Purpose of content, Accessible content, Case study for any one company that benefitted due to digital marketing.

Recommended Books / Suggested Readings:

1. Damian Ryan and Calvin Jones, “Understanding Digital Marketing”.
2. Puneet Singh Bhatia, Fundamentals of Digital Marketing First Edition, Publication Pearson.
3. Venkatraman Rolla, “Digital Marketing Practice guide for SMB: SEO, SEM and SMM”, CreateSpace Independent Publishing Platform, First edition.
4. Shivani Karwar, “Digital Marketing Handbook: A Guide to search Engine Optimization, Pay Per Click Marketing, Email Marketing and Content Marketing”, CreateSpace Independent Publishing Platform, 1st edition.
5. Ian Dodson, “The art of Digital Marketing”. Simon Kingsnorth, “Digital Marketing Strategy”.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks

End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT413: Search Engine Optimization
Credits: 3
LTP 300

Course Description:
The course aims to equip the students with the ways in which search engines function as well as how users interact with them with an eye towards predicting customer behaviors who search for goods and services.
The course includes SEO, Website Structure, Quality Score Optimization.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the overview of search engine marketing.
CO2: Create Web pages designed to be easily crawled and optimally indexed by search engines.
CO3: Discuss Google Analytics and other metrics and tools to monitor progress in achieving search engine marketing goals and Attract inbound Links from other Web Sites.
CO4: Describe the basic principles of Pay Per Click campaigns.

Course Content

UNIT I

Search-Engine Optimization: Find Your Target Audience, Set Budget, Set Goals, Keyword Generation, Using the Google AdWords Keyword Tool, Bing Keyword Tool. Creating Pages: An Introduction to Creating Pages, Choose Filenames, Optimize Title Tags, Optimize Meta Keyword Tags, create a Meta Robots Tag, Add Emphasis with Header Tags, Optimize Images, Create Links, Validate HTML

UNIT II

Website Structure: Web Hosting, Optimize for Multiple Browsers, Plan and Design a Website Structure, create a Robots.txt File, specify a Canonical Page, Using the No follow Attribute, Creating Content, Using Latent Semantic Content, Optimize Non-HTML Documents. Creating Communities: Create a Blog with WordPress, create a Blog with Tumblr, Write Search-Engine-Optimized Posts, create a community with Vbulletin's, Create a community with phpBB.

UNIT III

Building Links: Gather Link Intelligence with Open Site Explorer, Using Effective Anchor Text, Content Marketing with Guest Blogging, and Info graphics. Using Google Analytics, Set Up E-Commerce Tracking, Insert Tracking Code on Your Thank You page, Using Third party Shopping Carts. Social Media Optimization. Creating Pay-Per-Click Campaigns: Learn About AdWords' Accounts, create an AdWords Campaign, Using Google AdWords Editor, Optimize Your Account.

UNIT IV

Quality Score Optimization: View your Quality Scores, Optimize Your Quality Score, Test Ad Copy with Advance Keyword Insertion, Using Display Network Target Campaigns, Install Remarketing, Optimize Your Landing Pages Optimizing for Other Search Engines, Increase Exposure an Ask.com, Improve Your Ranking on Bing, Using Shopping Engines to Drive Traffic, Produce Sales with eBay Auctions. Using Craigslist to Drive Traffic, Get Listed on Local.com and ReferLocal.com.

Recommended Books / Suggested Readings:

1. Search Engine Optimization for Dummie by Peter Kent.
2. Search Engine Optimization 3rd Edition by Kristopher B. Jones and Foreword by Boyk.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

Skill Enhanced Course (SEC)

BIT311: Programming in PHP
Credits: 4
LTP 400

Course Description: The course aims to equip the students to understand how server-side programming works on the web. The course includes PHP basic syntax for variable types, conditional structures, storing data in arrays using PHP built-in functions and creating custom functions.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the concepts of PHP.
CO2: Create, back up a MySQL database.
CO3: Describe the concepts of loop, array, functions and String in PHP.
CO4: Describe the concepts of PHP connection with MySQL.

Course Content

UNIT-I

Introduction: Introduction- open source-PHP – history- features-variables- statements, operators-conditional statements-if-switch-nesting conditions-merging forms with conditional statements-loops-while-do-for – loop iteration with break and continue.

UNIT - II

Arrays and Functions: Arrays: Creating an array- modifying array-processing array-grouping form with arrays-using array functions- creating user defined functions- using files- sessions- cookies- executing external programs-Creating sample applications using PHP.

UNIT –III

Database Management System: Definition and benefits of database-Data Independence-Three level of database architecture, Domains-Relations-Integrity constraints, Normalizations. **MySQL**: MySQL Tools, connection Databases and tables, MySQL data types, Creating and manipulating tables Insertion, updating and deletion of rows in tables. Retrieving data, Functions: Aggregate functions -Grouping data- Sub queries- Joining Tables.

UNIT-V

PHP with MySQL: Working MySQL with PHP, database connectivity, usage of MYSQL commands in PHP, handling errors, debugging and diagnostic functions, validating user input through Database layer and Application layer, formatting query output with Character, Numeric, Date and time –sample database applications.

Recommended Books / Suggested Readings:

1. VIKRAM VASWANI, “PHP and MySQL”, Tata McGraw-Hill, 2005
2. BEN FORTA,” MySQL Crash course “SAMS, 2006.
3. C.J. DATE, “An Introduction to Database Systems”, Addison Wesley, Sixth Edition.
4. 4.RameshElmasri and Shamkant B Navathe,” Fundamentals of Database Systems”, Pearson Education, Third Edition.
5. Tim Converse, Joyce Park and Clark Morgan,” PHP 5 and MySQL”, Wiley India reprint, 2008.
6. Robert Sheldon, Geoff Moes,” Beginning MySQL”, Wrox, 2005.
7. Alexis Leon and Mathews Leon, “Database Management Systems”, Vikas, 2008.

Course Assessment Pattern:

Criteria	Description	Maximum Marks

Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT331: Programming in PHP Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students to understand how server-side programming works on the web. The course includes PHP basic syntax for variable types, conditional structures, storing data in arrays using PHP built-in functions and creating custom functions.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the concepts of PHP.
CO2: Create, back up a MySQL database.
CO3: Describe the concepts of loop, array, functions and String in PHP.
CO4: Describe the concepts of PHP connection with MySQL.

List of Practical:

1. Creating simple webpage using PHP script.

2. Implement the conditional statements in PHP

3. To study and Implement the looping statements in PHP

4. To implement the concept of an arrays

5. To make use of array functions

6. To create user defined functions

7. To create a file and write a text in it.

8. Creating simple applications using PHP

12. Creating simple table with constraints in MySQL

13. Insertion, Updating and Deletion of rows in MYSQL tables

18. Usage of aggregate functions and working with set operators.

20. Working with string, numeric and date functions

21. Database connectivity in PHP with MySQL

22. Validating Input and formatting the Output.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given)	15 Marks

	• Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT312: Programming in C#
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the C# Programming. The course includes # basics, Objects and Types, Inheritance.

Course Outcomes (CO):

Upon successful completion of this course, students will be able to:

CO1: Describe the fundamentals concept of C#.
CO2: Develop simple programs in C#.
CO3: Use appropriate data sources in C# applications.
CO4: Describe the methods, arrays, Strings.

Course Contents

UNIT-I

Introducing C#: Evolution of C#, Characteristics of C#, Applications of C#, Overview of C#, Literals, Variables and Data Types. Operators and Expressions, Decision Making and Branching and Looping.

UNIT-II

Methods in C#: Declaring Methods, Main Method, Invoking Method, Nesting of Methods, Pass by Value, Pass by Reference.
Handling Arrays: One Dimensional Arrays, Two Dimensional Arrays, jagged arrays, assigning array references, Using the length property, Implicitly typed array.
Creating Strings: String Methods, Comparing Strings.

UNIT-III

Structures and Enumerations: Structures, structs with methods, Nested Structs Enumerations, Enumerator Initialization.
Classes and Objects: Basic Principles of OOP Defining a Class, Creating Objects.
Constructors: Overloaded Constructors, Copy Constructors, Destructors.

UNIT-IV

Inheritance and Polymorphism: Classical Inheritance-Containment Inheritance, defining a Subclass-Defining Subclass Constructor, Multilevel Inheritance, Overriding Methods, Defining an Interface-Implementing Interface, Overloaded Operators, Overloaded Unary Operator, Overloaded Binary Operator

Recommended Books / Suggested Readings:

2. E. Balagurusamy, PROGARAMMING IN C#, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Yashwant Kanetkar, Let Us C#, Tata McGraw-Hill Publishing Company Ltd, New Delhi.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT332: Programming in C# Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the C# Programming. The course includes # basics, Objects and Types, Inheritance.

Course Outcomes (CO):

After completion of course, Students will be able to:

CO1: Understand use of C# basics, Objects and Types, Inheritance.
CO2: Develop simple programs in C#.
CO3: Use appropriate data sources in C# applications.
CO4: Develop, implement and creating Applications with C#.

List of Practical:

1. To Check whether a number is Palindrome or not.
2. Write a C# program to demonstrate a basic calculator using command line arguments.
3. To find the roots of Quadratic Equation.
4. C# Program to Display the ATM Transaction.
5. Write a C# program to show the machine details like machine name, Operating System, Version, Physical Memory and calculate the time since the Last Boot Up.
6. Write a Program in C# to demonstrate boxing and unboxing
7. To demonstrate Operator overloading.
8. To write a C# program using Branching and Looping statements.
9. To write a C# program using Arrays and Strings methods.
10. To multiply to matrices using Rectangular arrays.
11. To write a C# program using Structures and enumerations
12. To reverse a given string using C#.
13. To write a C# program using inheritance concepts.
14. To write a C# program using Polymorphism.
15. To write a C# program using interfaces.
16. To write a C# program by using operator overloading.
17. To write a C# program using delegates, events, errors and exceptions.
18. Use Try, Catch and Finally blocks to demonstrate error handling.
19. Demonstrate Use of Virtual and override key words in C# with a simple program.
20. C# Program to Demonstrate Tower of Hanoi
21. C# Program to Create a HangMan Game.
22. C# Program to Perform a Number Guessing Game.
23. C# Program to Prefix Game.
24. C# Program to Display the IP Address of the Machine.
25. C# Program to Illustrate how User Authentication is Done.
26. C# Program to Establish Client Server Relationship.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks

	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT414: Shell Programming and Linux Administration

Credits: 2
LTP 200

Course Description: The course aims to equip the students with a comprehensive study of the Linux and Shell Programming.
The course includes shell scripts, Linux systems, Graphical Desktop.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Operate with the Linux operating system.
CO2: Understand the basic set of commands and utilities in Linux systems.
CO3: Develop software for Linux systems.
CO4: Understand file systems and directories and operate them.

Course Content

UNIT-I

Introduction to Linux: History of Linux, Distributions, Linux kernel vs distribution. Linux in market, Importance of Linux in software ecosystem.

UNIT-II

Linux Structure: Linux Architecture, Filesystem basics, boot process, init scripts, run levels, shutdown process, introductions to Linux processes, **File Operations:** Filesystem, Filesystem architecture, File types, File attributes, Working with files. **Graphical Desktop:** Session Management, Basic Desktop Operations, Network Management, Installing and Updating Software, Text editors: gedit, vi, vim, emacs, Graphics editors.

UNIT-III

Linux commands: system Linux commands: ls, cat, touch, mv, cp, bc, mkdir, chmod, date, time, cd and other file and directory related commands. **Basic Shell Scripting:** Basic Shell Scripting Features and capabilities, Syntax, Constructs, modifying files, Sed, awk command, File manipulation utilities, dealing with large files and Text, String manipulation, Boolean expressions, File tests, Case, Debugging, Regular expressions.

UNIT-IV

Core Linux Administration: Configuring DHCP server and client, configure a DNS Server with a domain name of your choice, configure a Linux server and transfer files to a windows client (Setting up NFS File Server), Configure FTP on Linux Server. Transfer files to demonstrate the working of the same.

Recommended Books / Suggested Readings:

1. Linux: The complete reference by Richard Petersen, Published by Tata McGraw-Hill Publication.
2. Official Ubuntu Book, 8th Edition, by Matthew Helmke Elizabeth K. Joseph with Jose Antonio Rey and Philips Ballew, Prentice Hall.
3. Linux in a Nutshell: A Desktop Quick Reference, 6th Edition by Stephen Figgins, Arnold Robbins, Ellen Siever& Robert Love Published by O'Reilly Media.
4. Linux Administration: A Beginner's Guide by Steve Shah & Wale Soyinka, Published by McGraw-Hill Education.
5. Unix Shell Programming by Yashavant P. Kanetkar, Published by BPB Publishers.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks

Total	100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT434: Shell Programming and Linux Administration Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of the Linux and Shell Programming.
The course includes shell scripts, Linux systems, Graphical Desktop.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Discuss **v**arious basic commands, redirection and input/output of Linux based operating systems.
CO2: Understand the fundamental concepts of programming like loops, conditions, operators etc. specific to Shell Programming.
CO3: Develop shell scripts for various built-in commands of Linux.
CO4: Master the server setup to learn Linux administration.

List of Practical:
1. Linux Installation: Install your choice of Linux distribution e.g. Ubuntu, Fedora, Debian.
2. Installing and Removing Software: Install gcc package. Verify that it runs, and then remove it.
3. Command line operations: a. Install any new package on your system. b. Remove the package installed. c. Find the passwd file in / using find command. d. Create a symbolic link to the file you found in last step. e. Create an empty file example.txt and move it in /tmp directory using relative pathname.
4. File Operations: a. Explore mounted filesystems on your system. b. What are different ways of exploring mounted filesystems on Linux. c. Archive and backup your home directory or work directory using tar, gzip commands. d. Use dd command to create files and explore different options to dd. e. Use diff command to create diff of two files. f. Use patch command to patch a file. And analyze the patch using diff command again.
5. Linux Editors: vim/emacsa. Create, modify, search, and navigate a file in editor. b. Learn all essential commands.
6. Linux Security: a. Use of sudo to change user privileges to root. b. Identify all operations that require pseudo privileges. c. Create a new user and add it to pseudo configuration file. d. Set password for new user. e. Modify the expiration date for new user using password ageing. f. Delete newly added user.
7. Programs based on shell scripting.
8. Configuring DHCP server and client.
9. Configure a DNS Server with a domain name of your choice.
10. Configure a Linux server and transfer files to a windows client (Setting up NFS File Server).
11. Configure FTP on Linux Server. Transfer files to demonstrate the working of the same.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks

External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT415: Penetration Testing with Kali Linux

Credits: 2

LTP 200

Course Description: The course aims to equip the students with basic knowledge of Kali Linux, penetration testing and IT security techniques that lies under the cyber security.

Course Outcomes (CO): Upon successful completion of the course, the students should be able to:
CO1: Discuss the installation, booting of Linux operating system.
CO2: Identify Vulnerability Assessment of wireless network.
CO3: Classify the basic structure of Exploits and Client-Side Attack and privileges escalation.
CO4: Apply a mature understanding of various types of penetration testing.

Course Content

UNIT I

Introduction to Kali Linux: Features, Commands to help you navigate any Linux system, Installation & Configuration of Kali Linux- Different ways of installing Kali Linux, Bootable device, Hard disk installation, Dual boot, Virtualization, Updating Kali Linux.

UNIT II

Working with tools in Kali Linux: Study the various website penetration tools, Forensic tools, password cracking tools and Information Gathering tools in Kali Linux.

UNIT III

Sniffing and Spoofing: About Sniffing and Spoofing, Using Mac Changer Tool, Using Wireshark Tool: Menu Options, User Data Dissection, Viewing Type Object Dissection, Viewing User Data Dissection. Learning to other tools like Vega Usage, ZapProxy etc.

UNIT IV

Downloading Files: get, curl, axel command for fetching the resources online. **Database Tools Usage:** Introduction and usage of sqlmap, sqlninja.**CMS Scanning Tools**: Introduction and usage of WPScan, Joomscan.**SSL Scanning Tools**: Introduction and usage of TLSSLed, w3af.

Recommended Books / Suggested Readings:

1. Learning Kali Linux: Security Testing, Penetration Testing, and Ethical Hacking by Ric Messier
2. The Ultimate Kali Linux Book - Second Edition: Perform Advanced Penetration Testing Using Nmap, Metasploit, Aircrack-Ng, and EmpireBook Glen D. Singh
3. Linux Basics for Hackers: Getting Started with Networking, Scripting, and Security in Kali Paperback – 4 December 2018 Occupy the Web.
4. https://www.offensive-security.com/documentation/penetration-testing-with-kali.pdf
5. **Course Assessment Pattern:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks

	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT435: Penetration Testing with Kali Linux Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of the Linux and Shell Programming.
The course includes shell scripts, Linux systems, Graphical Desktop.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Various basic commands, redirection and input/output of Linux based operating systems.
CO2: Understand the fundamental concepts of programming like loops, conditions, operators etc. specific to Shell Programming.
CO3: Develop shell scripts for various built-in commands of Linux.
CO4: Master the server setup to learn Linux administration.

List of Practical:

1. To study various command of Nmap tool and its usage.
2. Using information gathering techniques to identify and enumerate targets running various operating systems and services.
3. To perform the password brute force attack.
4. To perform the password cracking using dictionary attack.
5. To perform penetration testing process using tools in Kali Linux.
6. To perform Sniffing network traffic and understanding the packet flow using tools like Wireshark.
7. To study different types of malware (Trojan, Virus, worms, etc.), performing system auditing for malware attacks, malware analysis, and countermeasures.
8. To study the downloading of the file from command line.
9. To make usage of sqlmap/ SQL ninja tool for SQL exploit.
10. To study the tools WPScan/ Joomscan to find vulnerabilities in CMS's.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT504: Principles of Information Security
Credits: 2
LTP 200

Course Description: The course aims to equip the students with a comprehensive study of the Principles of Information Security.
The course includes cryptography, encryption techniques, network security, cryptography.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Acquire a practical overview of the issues involved in the field of information security.
CO2: Demonstrate a basic understanding of the practice of information security.
CO3: Understand the information security risks across diverse settings including the Internet and WWW based commerce systems.
CO4: Explore the idea that in Information Security answers are not always known, and proposed solutions could give rise to new, equally complex problems.
CO5: Develop the understating about information security.

Course Content

Unit-I

INTRODUCTION: Meaning, importance, basics -changing nature and global information systems. Threats: New Technologies Open Door Threats -information Level Threats Vs Network Level-Threats -Information system security -Computer Viruses -Classifications of Threats and assessing damages and protecting information system security.

Unit-II

INFORMATION SECURITY POLICY: Security policy, standards, guidelines, Information security management system, Basic Principles, Security related Terms, Three Pillars of Information Security. Information Classification, criteria for information and classification.

Unit-III

PHYSICAL SECURITY: Need, Meaning, Natural Disasters and control, basic tenets of physical security of information systems resources, physical entry controls. Biometrics Controls for Security: Introduction, Access Control, User Identification & Authentication. Meaning, Nature of Biometric identification/Authentication techniques, Biometric techniques. Key Success factors and benefits.

Unit-IV

NETWORK SECURITY, CRYPTOGRAPHY: Need, Basic concepts, network security dimensions, establishing security perimeter for network protection, Network types, Firewall: Introduction, need, topologies for different type of firewalls. Cryptography: basic elements of cryptography, Digital Signature, Cryptography algorithms –IES, DES, AES and public key cryptography (RSA).

Recommended Books / Suggested Readings:

1. Nina Godbole (2009), “Information Systems Security”, Wiley Publications.
2. AtulKahate (2003), “Cryptography & Network Security”, TataMcgraw.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks

Total	100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT524: Principles of Information Security Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of the Principles of Information Security.
The course includes cryptography, encryption techniques, network security, cryptography.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Demonstrate a basic understanding of the practice of information security.
CO2: Be familiar with how threats to an organization are discovered, analyzed, and dealt with.
CO3: Be familiar with network security threats and countermeasures.
CO4: Develop the understating about information security.

List of Practical:

1. Study of Network Security fundamentals -Ethical Hacking, Social Engineering practices.
2. Study of System threat attacks -Denial of Services.
3. Study of Sniffing and Spoofing attacks.
4. Study of Techniques uses for Web Based Password Capturing.
5. Study of Different attacks causes by Virus and Trojans.
6. Study of Anti-Intrusion Technique: Honey pot.
7. Study of Symmetric Encryption Scheme: RC4.
8. Implementation different types of algorithms of Cryptography.
9. Study of IP based Authentication.

Note: Software: Turbo C++ IDE (TurboC3), Borland Turbo C++ (Version 4.5) and Cryp Tool.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks

	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT518: Ethical Hacking Fundamentals
Credits: 2
LTP 200

Course Description: The course aims to equip the students with a comprehensive study of Ethical Hacking. The course includes Intrusion Detection, Policy Creation, Social Engineering, Buffer Overflows and different types of Attacks and their protection mechanisms.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Describe the concepts of ethical hacking.
CO2: Explain the stages of a cyber-attack.
CO3: Describe and perform basic reconnaissance exercises.
CO4: Describe various types of malware and cyber-attack vectors and players.
CO5: Describe and perform various methods for evading security controls.
CO6: Describe and perform vulnerability and pen testing assessments and exercises.

Course Content

UNIT-I

Introduction to Ethical Hacking: Hacking Methodology, Process of Malicious Hacking, Foot printing and Scanning: Foot printing, Scanning. Enumeration: Enumeration. System Hacking and Trojans: System Hacking, Trojans and Black Box Vs White Box Techniques.

UNIT-II

Hacking Methodology: Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques.

UNIT-III

Web and Network Hacking: SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls.

UNIT-IV

Ethical Hacking Laws and Tests: An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking, Social Engineering, Host Reconnaissance.

Recommended Books / Suggested Readings:

1. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Nework Defense", Second Edition, CENGAGE Course.
2. Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Course. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series, Elsevier.
3. Whitaker & Newman, "Penetration Testing and Network Defense", Cisco Press, Indianapolis.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks

Total	100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT538: Ethical Hacking Fundamentals Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of Ethical Hacking. The course includes Intrusion Detection, Policy Creation, Social Engineering, Buffer Overflows and different types of Attacks and their protection mechanisms.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Describe the concepts of ethical hacking.
CO2: Describe and perform vulnerability and pen testing assessments and exercises.
CO3: Discuss about various hacking tools.
CO4: Describe the password cracking tools.

List of Practical:

1. To study various Hacking tools.
2. To study various Potential Security Threats.
3. Passive Reconnaissance using "Who is" and Online tools.
4. Active Reconnaissance using "Sampad" and web site details.
5. Full Scan, Half Open Scan and Stealth scan using "nmap".
6. UDP and Ping Scanning using "Advance Lan Scanner" and "Superscan".
7. Packet crafting using "Packet creator" tools.
8. Password Revelation from browsers and social networking application.
9. Creating and Analyzing spoofed emails.
10. Creating and Analyzing Trojans.
11. Configure ARP entries in Windows.
12. To study various password cracking tools.
13. Crack Wireless Password
14. OS password cracking.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks

	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT617: Image Editing Tool
Credits: 2
LTP 200

Course Description: The course aims to equip the students with a basic knowledge of image editing.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the concepts of image editing.
CO2: Analyze, synthesize, and utilize image editing processes.
CO3: Apply graphic design principles in the ideation, development, and production of digital messages.
CO4: Identify and utilize design tool for image editing.

Course Content

UNIT-I

Introduction: Raster vs. Vector, creating new images, saving files for print, saving files for web/screen, Getting to Know the Work Area, Using the tools, Using the options bar and other panels, Undoing actions in Photoshop, Customizing the workspace, Tools panel overview.

UNIT-II

Basic Photo Corrections: Strategy for retouching, Resolution and image size, Adjusting the color in Camera Raw, Straightening and cropping the image in Photoshop, replacing colors in an image, adjusting saturation with the Sponge tool, repairing areas with the COne Stamp tool, Using the Spot Healing Brush tool, using content-aware fill, Applying the Unsharp Mask filter.

UNIT-III

Working with Selections: About selecting and selection tools, Using the Quick Selection tool, moving a selected area, manipulating selections, Using the Magic Wand tool, selecting with the lasso tools, rotating a selection, selecting with the Magnetic Lasso tool, cropping an image and erasing within a selection, Refining the edge of a selection.

UNIT-IV

Layer Basics: About layers, Using the Layers panel, rearranging layers, applying a gradient to a layer, applying a layer style, Flattening and saving files. **Masks and Channels:** Working with masks and channels, creating a mask, refining a mask, creating a quick mask, manipulating an image with Puppet Warp, Working with channels.

Recommended Books / Suggested Readings:

1. Adobe Photoshop CC Classroom in a Book, First Edition , By Pearson, by Andrew Faulkner and Conrad Chavez
2. Adobe Photoshop Classroom in a Book (2020 release) by Chavez Conrad and Faulkner Andrew
3. Photoshop CS6 Beta New Features: Digital Classroom Preview by Jennifer Smith

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks

	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT637: Image Editing Tool Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a basic knowledge of image editing.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the concepts of image editing.
CO2: Analyze, synthesize, and utilize image editing processes.
CO3: Apply graphic design principles in the ideation, development, and production of digital messages.
CO4: Identify and utilize design tool for image editing.

List of Practical:

1. To study the elements of Adobe Photoshop window.
2. To study the tool box in Photoshop.
3. To study the concept of Layers in Photoshop.
4. To study the Tools in Photoshop.
5. To study the filters in Photoshop.
6. To create a Visiting Card by using appropriate tools in Photoshop.
7. Design a photo frame using custom shapes in Photoshop.
8. Convert a color photo to black and white photo.
9. Create a Cover Page for a text book.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT618: **Mobile App Development**
Credits: 2
LTP 200

Course Description: The course aims to equip the students to understand, how to develop and deploy an application to the app market.
The course includes Android mobile application development.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Understand the development environment for Android applications development.
CO2: Develop basic Mobile applications.
CO3: Understanding the Components of an Android Application.
CO4: Applying the concept of SQLite and location-based services.

Prerequisite: Java Programming.

Course Content

UNIT I

Introduction to Android: Overview, History, Features of Android, Architecture of Android, Linux Kernel, Native Libraries, Android Runtime, Application Framework, Applications, Introduction to Android Studio, setting up the Android Emulator, steps in creating hello world Application.

UNIT II

Activities, Fragments and Intents: Introduction to Activities, Activity Lifecycle, Components of an Android Application, Introduction to Intents, Linking Activities using Intents, calling built-in applications using Intents, Introduction to Fragments, Adding Fragments Dynamically, Lifecycle of Fragment, Interaction between Fragments. **Android User Interface**: Understanding the Components of a Screen, Views and View Groups, Adapting to Display Orientation.

UNIT III

Fragments: Understanding the Fragments. **Designing Your User Interface with Views:** Using Basic Views, Picker Views and List View. **Displaying Pictures and Menus**: Using Image Views to Display Pictures, Gallery and Image View Views.

UNIT IV

Databases: Introduction to SQLite, SQLite Open Helper and SQLite Database, Creating and Using Database, Building and executing queries. **Messaging and E-mail**: Introduction to SMS Messaging and Sending E-mail. **Location-Based Services and Google Map**: Display Google Maps, Getting Location Data.

Recommended Books / Suggested Readings:

1. Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication.
2. Professional Android 4 Application Development, By Reto Meier WROX Publication.
3. Wei-Meng Lee, Beginning android 4 application Development, John Wiley & sons, Inc, 2012.
4. Andrew Whitechapel, Sean McKenna, Windows Phone 8 Development Internals, Microsoft Press 2013.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT638: Mobile App Development Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students to develop skills in Android Studio. The course includes mobile Programming basic concepts.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the development environment for developing and running an Android application.
CO2: Create a simple application that runs under the Android operating system.
CO3: Describe deploy android applications.

CO4: Create application to send the SMS and email.

Lab Exercises:

1. Creating "Hello world" Application.
2. Activity Lifecycle
3. Develop an application to implement the concept of intent.
4. Linking Activities using Intents
5. Fragments
6. Creating an application that displays message based on the screen orientation.
7. Develop an application using Picker view.
8. Develop an application using List view.
9. Develop an application using Image Views
10. Read/ write the Local data using user preferences.
11. Create / Read / Write data with database (SQLite).
12. Create an application to send SMS.
13. Create an application to send an e-mail.
14. Display Map based on the Current/given location.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks

	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

Discipline Specific Elective (DSE)

BIT501: Python Programming
Credits: 2
LTP 200

Course Description: The course aims to equip the students with a comprehensive study of Python Programming. The course includes Object-Oriented paradigm in Python programs, Python functions, Python exception handling mechanism.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Familiar with Python environment, data types, operators used in Python.
CO2: Compare and contrast Python with other programming languages.
CO3: Learn the use of control structures and numerous native data types with their methods.
CO4: Design user defined functions, modules, and packages.
CO5: Identify and handle the exceptions in programs through appropriate exceptions handling methods.

Course Content

UNIT-I

Introduction: Why do people use python? Python a scripting language, Users of Python, Need of Python, Python's Technical Strengths. How Python runs programs: Introducing the Python Interpreter, Program Execution. Execution Model Variation: Python Implementation Alternatives. **Data Types & Input/Output:** Keywords, Identifiers, Python Statement, Indentation, Documentation, Variables, Multiple Assignment, Understanding Data Type, Data Type Conversion, Python Input and Output Functions, Import command. **Operators and Expressions:** Operators in Python, Expressions, Precedence, Associativity of Operators, Non-Associative Operators.

UNIT-II

Control Structures: Decision making statements, Python loops, Python control statements. **Strings Fundamentals:** String Basics, String Literals, Strings in action, String Methods -Lists and Dictionaries, Tuples-Files. **Module:** Importing Module, Math Module, Random Module, Package, Composition and The Distribution Utility.

UNIT-III

Functions: Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions. **Classes & OOP:** Introduction, Class Coding Basics, Class Coding details: Class Statement, Methods, Inheritance, designing with classes: Python and OOP, OOP Inheritance, Composition, Delegation, Methods and Classes act as Objects, Multiple Inheritance.

UNIT-IV

Exception Handling: Exceptions, Built-in exceptions, Exception handling, User defined exceptions in Python. **File Management in Python:** Operations on files (opening, modes, attributes, encoding, closing), read () & write () methods, tell () & seek () methods, renaming & deleting files in Python, directories in Python.

Recommended Books / Suggested Readings:

1. Programming in Python, Pooja Sharma, BPB Publications, 2017.2.
2. Core Python Programming, R. Nageswara Rao, 2nd Edition, Dreamtech.3.
3. Python in a Nutshell, A. Martelli, A. Ravenscroft, S. Holden, OREILLY.
4. Python, The complete Reference, Martin C. Brown, McGraw Hill Education.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks

End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT521: Python Programming Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of Python Programming. The course includes Object-Oriented paradigm in Python programs, Python functions, Python exception handling mechanism.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Solve simple to advanced problems using Python language.
CO2: Develop logic of various programming problems using numerous data types and control structures of Python.
CO3: Implement different data structures using Python.
CO4: Implement modules and functions using Python.
CO5: Design and implement the concept of object-oriented programming structures.
CO6: Implement files handling.

List of Practical:

1. Write a program to add two numbers.
2. Write a program that declares 3 integers, determines and prints the largest and smallest in the group.
3. Write a program for factorial of a number.
4. Write a program to calculate simple interest.
5. Write a program to find that given year is leap year or not.
6. Write a program to implement linear search and binary search.
7. Write a program to find that given number is Armstrong or not.
8. Write a program to print Fibonacci Series.
9. Write a program to convert decimal number into binary numbers.
10. Python Program to find sum of array.
11. Write a program to find largest number of elements in array.
12. Write a program to check if a string is palindrome or not.
13. Maintain book record as per their serial numbers in library using dictionary.
14. Write a program to concatenate two dictionaries into one.
15. Perform following operations on dictionary 1) Insert 2) delete 3) change 4) update.
16. Write a program to calculate addition of two number using methods.
17. Program to calculate average of numbers using function.
18. Fibonacci series using recursion.
19. Write a program to create a module of factorial in Python.
20. Write A Program to Find the Area of a Rectangle Using Classes
21. Write A Program to Append, Delete and Display Elements of a List Using Classes
22. Write A Program to Create a Class and Compute the Area and the Perimeter of the Circle
23. Write A Program to Create a Class which Performs Basic Calculator Operations
24. Write A Program to Create a Class in which One Method Accepts a String from the User and Another Prints it.
25. Write A Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File.
26. Write A Program to Read a Text File and Print all the Numbers Present in the Text File.
27. Write a program for generation of pyramid.

Pyramid 1	Pyramid 2	Pyramid 3	Pyramid 4	Pyramid 5
*	* * * *	*	*	1
* *	* * *	* *	* * *	1 2
* * *	* *	* * *	* * * * *	1 2 3
* * * *	*	* * * *	* * *	1 2 3 4
			*	

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT519: Fundamental of Latex
Credits: 2
LTP 200

Course Description: The course aims to equip the students with a comprehensive study of the LATEX. The course includes Typesetting text, references.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Structure the document with well familiarized documenting abilities.
CO2: Frame a document for self or University.
CO3: Define and use Equations within LaTeX.
CO4: Use BibTeX to maintain bibliographic information and to generate a bibliography for a particular document.

Course Content

UNIT-I

Introduction-What is LATEX. Document Structure- Essentials, Troubleshooting**,** Creating a title, Sections, Labelling, Table of Contents.

UNIT-II

Typesetting text-Font effects, Colored text, Font sizes, Lists, Comments and spacing, Special characters.

UNIT-III

Tables, Figures. Equations-Inserting Equations, Mathematical Symbols.

UNIT-IV

Inserting References- Introduction, BibTeX file, Inserting the bibliography, Citing references, Styles.

Recommended Books / Suggested Readings:

1. Martin J. Erickson and Donald Bindner, A Student's Guide to the Study, Practice, and Tools of Modern Mathematics, CRC Press, Boca Raton, FL, 2011.
2. L. Lamport. LATEX: A Document Preparation System, User's Guide and Reference Manual. Addison-Wesley, New York, second edition, 1994.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT539: Fundamental of Latex Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students equip the students with a comprehensive study of the LATEX.
The course includes Typesetting text, references.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Structure the document with well familiarized documenting abilities.
CO2: Frame a document for self or University.
CO3: Type the mathematical formulae using LaTeX.
CO4: Use the preamble of LaTeX file to define document class and layout options.

List of Practical:

1. Installation of the software LaTeX
2. Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables
3. Page Layout –Titles, Abstract Chapters, Sections, References, Equation references, citation. List making environments Table of contents, generating new commands, Figure handling numbering, List of figures, List of tables, Generating index.
4. Packages: Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing.
5. Classes: article, book, report, beamer, slides.
6. Applications to: Writing Resume, writing question paper, writing articles/ research papers, Presentation using beamer.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT520: Programming in MATLAB
Credits: 2
LTP 200

Course Description: The course aims to equip the students to understand, how to develop and deploy an application to the app market.
The course includes various concepts of MATLAB
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the fundamentals in MATLAB.
CO2: Discuss the programming in MATLAB.
CO3: Describe the graphics plotting.
CO4: Discuss the Procedures and Functions.

Course Content

UNIT I

Introduction: Components of a computer, working with numbers, Machine code, Software hierarchy, Features of MATLAB, Uses of MATLAB.

UNIT II

Programming Environment: MATLAB Windows, Commands for Managing a Session, Commands for Working with the System, data types, A First Program, operator, Expressions, Constants, Variables and assignment statement.
Control Statements: decision making statements, Looping statements.

UNIT III

Array: One dimensional array, two-dimensional array, Special Arrays in MATLAB, Multidimensional Arrays.
Graph Plots: Basic plotting, built in functions, generating waveforms, Sound replay, load and save.

UNIT IV

Procedures and Functions: Arguments and return values, M-files, Formatted console input-output, String handling. Manipulating Text: Writing to a text file, reading from a text file, Randomizing and sorting a list, searching a list.
GUI Interface: Attaching buttons to actions, Getting Input, Setting Output.

Recommended Books / Suggested Readings:

1. MATLAB: An Introduction with Applications, by Amos Gilat, 2nd edition, Wiley, 2004.
2. C.B. Moler, Numerical Computing with MATLAB, SIAM, 2004.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT540: Programming in MATLAB Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students able to carry out simple numerical computations and analyses using MATLAB. The course includes simple calculations using MATLAB

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the fundamentals in MATLAB.
CO2: Understand the main features of the MATLAB development environment.
CO3: Write simple programs in MATLAB to solve scientific and mathematical problems.
CO4: Understand how to draw a basic graph application.

List of Practical:

1. Introduction to MATLAB.
2. Explain the main windows in MATLAB desktop.
3. Programming in MATLAB: Introduction, Branching statements, loops, functions, additional data types, arrays, inputs/outputs etc.
4. Program to display a Matrix
5. Program to Addition of matrix.
6. Basic graphic applications: Draw Curve, Refine the plot: Line pattern, color, and thickness, Draw multiple curves.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT510: C#.net
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the C# Programming. The course includes # basics, Objects and Types, Inheritance.

Course Outcomes (CO):
Upon successful completion of this course, students will be able to:

CO1: Describe the fundamentals concept of .NET Framework, C#.
CO2: Develop simple programs in C#.
CO3: Use appropriate data sources in C# applications.
CO4: Describe the methods, arrays, Strings.

Course Contents

UNIT I

Introduction to ASP.NET: .NET Framework (CLR, CLI, BCL), ASP.NET Basics, ASP.NET Page Structure, Page Life Cycle. Controls: HTML Server Controls, Web Server Controls, Web User Controls, Validation Controls, Custom Web Controls. **Introducing C#:** Evolution of C#, Characteristics of C#, Applications of C#, Overview of C#, Literals, Variables and Data Types. Operators and Expressions, Decision Making and Branching and Looping.

UNIT-II

Methods in C#: Declaring Methods, Main Method, Invoking Method, Nesting of Methods, Pass by Value, Pass by Reference. **Handling Arrays:** One Dimensional Arrays, Two Dimensional Arrays, Using the length property, implicitly typed array, String Methods, Comparing Strings. **Classes and Objects:** Basic Principles of OOP Defining a Class, Creating Objects. **Constructors:** Overloaded Constructors, Copy Constructors, Destructors.

UNIT-III

Inheritance and Polymorphism: Classical Inheritance-Containment Inheritance, defining a Subclass-Defining Subclass Constructor, Multilevel Inheritance, Overriding Methods, Defining an Interface-Implementing Interface, Overloaded Operators, Overloaded Unary Operator, Overloaded Binary Operator

UNIT-IV

Master Pages, Themes, Introduction to ADO.NET, Data Binding, Importing the SQL Client Namespace, Defining the Database Connection, Managing Content Using Grid View and Details View.

Recommended Books / Suggested Readings:

1. Beginning ASP.NET 4: in C# and VB (Wrox), ImarSpaanjaars, Paperback Edition
2. Sams Teach Yourself ASP.NET 4 in 24 Hours, Complete Starter Kit Scott Mitchell C# 8.0 and .NET, Core 3.0 is a book written by Mark J. Price.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks

End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT530: C#.net Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the C# Programming. The course includes # basics, Objects and Types, Inheritance.

Course Outcomes (CO):
Upon successful completion of this course, students will be able to:

CO1: Describe the fundamentals concept of .NET Framework, C#.
CO2: Develop simple programs in C#.
CO3: Use appropriate data sources in C# applications.
CO4: Describe the methods, arrays, Strings.

List of Practical:

1. Classes and objects
2. Inheritance
3. Operator overloading
4. Threading
5. Events and delegates
6. Working with windows forms controls
7. Validating data
8. Creating custom dialog box
9. Designing an MDI application with menu
10. Retrieving data from a SQL database
11. Manipulating data in a connected environment
12. Manipulating data in a disconnected environment

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks

	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT511: Computer Graphics and Multimedia
Credits: 4
LTP 310

Course Description: The course aims to equip the students to introduce computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends. The course includes PHP basic syntax for variable concepts of Computer Graphics.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe basics of Computer Graphics, Input/output primitive and basic transformations, which can be applied on objects of graphics.
CO2: Describe graphical primitives and their algorithms.
CO3: Demonstrate an understanding of contemporary graphics hardware.
CO4: Describe the techniques of clipping, three-dimensional graphics and three-dimensional transformations.

Course Content

UNIT I

Introduction to Computer Graphics: Applications of Computer Graphics. Graphs and Types of Graphs.
Graphics Hardware: The Functional Characteristics of the Systems are emphasized. **Input Device**: Keyboard Touch Panel, Light Pens, Graphic Tablets, Joysticks, Trackball, Data Glove, Digitizer, Image Scanner, Mouse, Voice Systems.

UNIT II

Video Display Devices: Refresh Cathode–Ray Tube, Raster Scan Display, Random Scan Displays, Color CRT-Monitors, Direct View Storage Tube, Flat Panel Displays, 3-D Viewing Devices, Raster Scan Systems, Random Scan Systems, Graphic Monitors and Workstation, Color Models (RGB and CMY), Lookup Table. **Scan Conversation Algorithm:** Process and need of Scan Conversion, Scan conversion algorithms for Line, Circle and Ellipse using direct method, Bresenham's algorithms for line & circle and Midpoint Ellipse Algorithm along with their derivations, Area Filling Techniques, Flood Fill Techniques, Character Generation.

UNIT III

2-Dimensional Graphics: Cartesian and Homogenous Co-Ordinate Systems, Geometrical Transformation (Translation, Scaling, Rotation, Reflection, Shearing), Viewing transformation and clipping (line, polygon and text) using Cohen-Sutherland, Sutherland Hodgeman and Liang Barsky algorithm for clipping.

UNIT IV

3-Dimensional Graphics: Introduction to 3-dimensional Graphics: Geometric Transformations (Translation, Scaling, Rotation), Mathematics of Projections (Parallel & Perspective). Color Shading. Introduction to Morphing techniques.

Recommended Books / Suggested Readings:

1. D. Hearn and M.P. Baker, Computer Graphics, PHI New Delhi.
2. R.L Phillips, Computer Graphics Principles & Practices, Second Edition, Pearson Education, 2007.
3. R.A. Plastock and G. Kalley, Computer Graphic, McGraw Hill, 1986.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks

Total	100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT531: Computer Graphics and Multimedia Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students to learn how to 'understanding of the Computer Graphics techniques concepts and algorithm. The course includes implementation of line drawing, circle drawing, polygon drawing, transformation of objects, scaling, viewing.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe practical fundamental of line drawing, circle drawing, polygon drawing and curve drawing.
CO2: Describe the concepts of different type of geometric transformation of objects in 2D and 3D.
CO3: Describe the practical implementation of modeling, rendering, viewing of objects in 2D and 3D.
CO4: Discuss about clipping algorithms. List out the shapes and filling algorithms.

Lab Exercises:

1. Implementation of Line Drawing algorithms: DDA, Bresenham and using them generates line with different styles like dotted, dashed, centered and thick line.
2. Implementation of Circle generation algorithm: Midpoint and using it generating concentric circles.
3. Implementation of Area Filling Algorithm: Boundary Fill, Flood Fill and Scan line Polygon Fill.
4. Program for performing Two Dimensional Transformations: Translation, Scaling, Rotation Reflection, Shear by using a homogeneous Matrix representation, use of a function for matrix multiplication is desirable, to perform composite transformation.
5. Program to represent a 3D object using polygon surfaces and then perform 3D transformation.
6. Flood fill algorithm.
7. Implementation of Cohen-Sutherland line clipping algorithm.
8. Implementation of Liang Barsky algorithm for line clipping.
9. Implementation of Sutherland-Hodgeman polygon clipping algorithm

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks

External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT505: Cloud computing
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the Cloud computing. The course includes Cloud Computing Architecture, Infrastructure as a Service (IaaS), Cloud Platforms.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:

CO1: Understand the basic concept and importance of cloud computing.
CO2: Present a survey on cloud building blocks and technologies.
CO3: Perform cloud computing admin and programming using open source tool and combinations.
CO4: Monitor and manage the cloud resources, applications and data while addressing the security concerns.
CO5: Use cloud solutions offered by industry leaders for various applications.

Course Content

UNIT-I

Overview of Computing Paradigm: Recent trends in Computing-Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing.

Introduction: Objectives, from collaborative to the Cloud -A short history Client-Server Computing, Peer-to-Peer Computing, Distributed Computing, Collaborative Computing, Cloud Computing, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

UNIT-II

Cloud Computing Architecture: Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS) , Platform as a Service(PaaS), Software as a Service(SaaS) Deployment Models Public cloud, Private cloud, Hybrid cloud, Community cloud.

UNIT-III

Infrastructure as a Service (IaaS): Introduction to IaaS, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine (VM) Resource Virtualization Server. Cloud Security - Infrastructure Security Network level security, Host level security, Application level security Data security and Storage Data privacy and security Issues.

UNIT-IV

Cloud Platforms in Industry: Amazon Web Services-Compute Services, Storage Services, Communication Services, Additional Services. Google App Engine-Architecture and Core Concepts, Application Life Cycle. Cost Model. Microsoft Azure-Azure Core Concepts, SQL Azure, Windows Azure Platform Appliance.

Recommended Books / Suggested Readings:

1. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, (2011), Cloud Computing: Principles and Paradigms, Wiley.
2. Mastering Cloud Computing, RajkumarBuyya, Christian Vecchiola, and ThamaraiSelvi, Tata McGraw Hill, ISBN-13: 978-1-25-902995-0, New Delhi, India, Feb 2013.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley India Pvt. Ltd, ISBN-13: 978-81-265-2980-3, New Delhi, India, 2011.
4. Cloud Computing: Principles and paradigms, Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski, Wiley India Pvt. Ltd, ISBN-13: 978-81-265-4125-6, New Delhi, India, 2011.
5. Cloud Computing for Dummies, Fern Halper, Hurwitz, Robin Bloor, Marcia Kaufman, Wiley India Pvt. Ltd, ISBN-13: 978-0-47-0597422, New Delhi, India, 2011.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks

	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT525: Cloud computing Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the Cloud computing. The course includes Cloud Computing Architecture, Infrastructure as a Service (IaaS), Cloud Platforms.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Earn the use of cloud computing tools offered by industry leaders.
CO2: Develop and deploy cloud applications using popular cloud platforms.
CO3: Configuration of the virtual machines on the cloud and building of a private cloud.
CO4: Monitor and manage the cloud resources, applications.

List of Practical:

1. Study and implementation of Infrastructure as a Service.
2. Study of Cloud Computing & Architecture
3. Installation and Configuration of virtualization using KVM.
4. Study and implementation of Infrastructure as a Service
5. Study and implementation of Storage as a Service
6. Study and implementation of identity management
7. Study Cloud Security management
8. Write a program for web feed.
9. User Management in Cloud.
10. Using public cloud service providers tools for exploring the usage of IaaS, PaaS and SaaS cloud services.
11. Setting up a private cloud using open source tools (Eucalyptus/Open Stack etc.).
12. Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform

Note: Hardware / Software Required: Ubuntu operating system, Internet, open-source software KVM, Virtual machine, WAMP/ZAMP server, any tool or technology can be used for implementation of web application e.g., JAVA, PHP, etc.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks

External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT512: Software Testing Methodology
Credits: 2
LTP 200

Course Description: The course aims to equip the students with comprehensive study of the Software Testing. The course includes Testing Strategies and Testing Tools.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:

CO1: Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.

CO2: Implement various test processes for quality improvement.

CO3: Design test planning and Manage the test process.

CO4: Describe different types of testing.

Course Content

UNIT-I

Software Quality, Role of testing, verification and validation, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection, White-Box and Black-Box Testing , Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management

Concept of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing , Mutation Testing , Debugging , Unit Testing in extreme Programming,

UNIT-II

System Test Categories: Basic Tests, Functionality Tests, Robustness Tests, Interoperability Tests, Performance Tests.

Functional Testing: Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing.

UNIT-III

System Test Design: Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Design Preparedness Metrics, Test case Design Effectiveness.

System Test Planning and Automation: Structure of a System Test Plan, Introduction and Feature Description, Test Suite Structure, Test Environment, Test Execution Strategy, Test Effort Estimation, Scheduling and Test Milestones, System Test Automation.

UNIT-IV

System Test Execution: Preparedness to Start System Testing, Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Beta Testing, First Customer Shipment, System Test Report, Product Sustaining, Measuring Test Effectiveness.

Acceptance Testing: Types of Acceptance Testing, Acceptance Criteria, Selection of Acceptance Criteria, Acceptance Test Plan, Acceptance Test Execution, Acceptance Test Report.

Recommended Books / Suggested Readings:

1. Naresh Chauhan, “Software Testing Principles and Practices”, Oxford University Press, 2010.
2. 'Software Testing and Quality Assurance: Theory and Practice' by SagarNaik, University of Waterloo, PiyuTripathy, Wiley, 2008.
3. Software Testing: Principles and Practices by Naresh Chauhan, 2012, Oxford Univesity Press.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks

	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT532: Software Testing Methodology Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with comprehensive study of the Software Testing. The course includes Testing Strategies and Testing Tools.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Apply the software testing techniques.
CO2: Use practical knowledge of a variety of ways to test software.
CO3: Construct and test simple programs.
CO4: Understand Selenium and automation testing approach.

List of Practical:

1. Introduction to Selenium and automation testing approach.
2. Test case execution- (i) Pause test case execution (ii) Resume it later (iii) Stop test case execution at a required step: Using breakpoint (iv) Start test case execution from a required step: Using Set Start point.
3. Commands to input data to AUT- type, send Keys, select, check, uncheck, click, submit, and Wait.
4. Retrieve data from AUT- storeText, storeAttribute, storeElementPresent
5. Wait for events in AUT- waitForText, waitForElementPresent, waitForAtrribute
6. Create a test case for various assert commands to examine the direction of test cases and display the result.
7. Demonstrate the use of verify commands to compare test results or output values
8. Build a test case script to record user actions on WebPages through automated testing.
9. Build a test suite to manually configure user login and search on WebPages.
10. Construct a test suite containing 4 test cases for add, subtract, multiply & divide.
11. Implementation of user extensions and regular expressions for Test cases.
12. Write applicable locating strategies with ID, Name, Link text, XPath for search dropdown box, search box, search button for any web-based platform.
13. Construct test cases for slideshare.net handling login, upload a file, delete and logout function. Conduct a test suite for online bus ticket booking service. Test suite should also include search functionality for the ongoing process.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks

	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT513: Web applications using ASP.NET

Credits: 2
LTP 200

Course Description: This course will help the students to understand ASP.NET web development with ADO.Net.

Course Outcomes
Upon successful completion of this course, students should be able to
CO1: Describe Database concepts in ADO.net and apply the knowledge to implement distributed data-driven applications using VB.Net, SQL-Server and ADO.Net.
CO2: Design, document, debug ASP.Net web forms with server and validation controls and implement ASP.Net web services.
CO3: Acquire fundamentals of Web application design, development, and deployment using ASP.NET

Course Contents

UNIT-I

Introduction: Overview of ASP.NET framework, Understanding ASP. NET Controls, Applications, Web servers, installation of IIS, Web forms, web form controls server controls, client controls. web forms & HTML, Adding controls to a web form, Buttons, Text Box, Labels, Checkbox, Radio Buttons, List Box, etc. Running a web Applications, creating a multiform web project.

UNIT-II

Form Validation: client-side validation, server-Side validation, validation controls: Required Field, Comparison, Range, Calendar control, Ad rotator Control, internet Explorer Control. State management- View state, Session state, Application state.

UNIT-III

ADO.NET: Architecture of ADO.NET, connected and Disconnected Database, create connection using ADO.NET Object Model, Connection Class, Command Class, Data Adapter Class, Dataset Class. Display data on data bound Controls and Data Grid.
Database Accessing on web applications: Data Binding concept with web, creating data grid, Binding standard web server controls. Display data on web form using Data bound control.

UNIT-IV

XML: Writing datasets to XML, Reading datasets with XML. **Web services:** Introduction, Remote method call using SOAP, web service description language, building & consuming web service, Web Application deployment**.**

Recommended Books / Suggested Readings:
1. ASP.NETThe Ultimate Beginner's Guide to Learn asp.net Step by Step, by Max Beerbohm, MoamlMohmmed
2. Developing Web Applications with ASP.NET and C# by Hank Meyne, Scott Davis
3. Creating ASP.NET Core Web Applications: Proven Approaches to Application Design and Development Paperback by Dirk Strauss

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks

	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT533: Web applications using ASP.NET Lab

Credits: 1
LTP 002

Course Description: This course will help to Set up a programming environment for ASP.net programs, configure an asp.net application and Creating ASP.Net applications using standard .net controls.

Course Outcomes
Upon successful completion of this course, students should be able to
CO1. Design web applications using ASP.NET
CO2. Use ASP.NET controls in web applications.
CO3. Debug and deploy ASP.NET web applications
CO4. Create database driven ASP.NET web applications and web services.

List of Experiments:

1. Design a web page for user registration that has following fields. User First Name, Last Name, DOB, city, pin code, user id, add new password, confirm password, Registration and cancel button.
2. Use validation control with necessary fields with registration form.
3. Store registration form data to the database when user click submit button. Provide error message with registration form if input user id has already existed, otherwise open a new web page.
4. Create a user login web page, when user input id and password are correct with database then open a new default web page containing user id. (Use session state variable)
5. Create a web page that will display all user information in tabular form.
6. Create a web page that will enable to edit any required fields to only login user.
7. Create web page that contain aid rotate control and is capable to display more than one images.
8. Create an XML file for student records that has following fields...Roll no, name, class. Branch.
9. Assign XML data base record into data sets and display into data grid.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks

	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT514: Advanced Web Design and Development
Credits: 2
LTP 200

Course Description: The course aims to equip the students with a comprehensive study of Advanced Web Application Development. The course includes Frameworks, AJAX, JQUERY and JS.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Generate web page using AJAX, JQUERY and JSP.
CO2: Understand website dynamic behavior and server-side programming.
CO3: Understand persistence Data storage.
CO4: Generate dynamic web pages using databases.
CO5: Develop web services and comprehend the significance of frameworks.

Course Content

UNIT I

Introduction to Web Designing: Web Technologies, HTML/ CSS, JavaScript, Bootstrap, Adobe Dreamweaver, Adobe Flash, HTML 5.

AJAX: AJAX: History of AJAX, AJAX using XML HttpRequest object-using XML and DOM, creating a full scaled AJAX Enabled Application using JSON.

UNIT II

PHP: Introduction String processing and regular expressions, Viewing Client/Server environment variables-Form processing and Business logic, verifying a username and password, connecting to a database.

JQUERY: jQuery basic, jQuery core, events, effects, plugins, user interface using jQuery UI.

UNIT III

Database Connectivity: Introduction, Relational Database: SQL-MYSQL-JBDC-Driver and Connection Management, Understanding JDBC ODBC connectivity, Connection and Pooled connection, Resultset, Datatype support, Prepared statement, Callable statements, Microsoft Language Integrate Query.

JSP and SERVLETS: Overview of JSP and Servlet, creating dynamic web pages using JSP Standard.

UNIT IV

Web Servers and Web Frameworks: Web servers: Introduction, HTTP/HTTPS Transactions, Multi-tier Application architecture, configuring web servers, Apache installation, Microsoft IIS Express and web matrix-Web Frame works. Web Services: WSDL, UDDI, SOAP-RPC.

Recommended Books / Suggested Readings:

1. A Beginner's Guide to Html Http://www.Ncsa.Nine.Edit/General/Internet/w ww/Html.Prmter
2. BayrossIvan, “HTML, DHTML, JavaScript, PERL, CGI”, 3rd Edition, BPB Publication,2009.
3. Programming PHP, “Kevin Tetroi”, O' Reilly.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT534: Advanced Web Design and Development Lab
Credits: 1
LTP 002

Course Description: The course aims to equip the students with a comprehensive study of Advanced Web Application Development.
The course includes Frameworks, AJAX, JQUERY and JS.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Create web pages using several technologies.
CO2: Store data in a table using web pages.
CO3: Develop website and web applications.
CO4: Generate web page using HTML5, AJAX, JQUERY.

List of Practical:

1. To study different web designing tools.
    a. Bootstrap
    b. Adobe Dreamweaver
    c. Adobe Flash
    d. HTML 5
2. HTML5 Input Types.
3. HTML5 Canvas.
4. HTML5 Web Storage.
5. Create a webpage using AJAX.
6. Implement jQuery.
7. JSP Programs.
8. Create a simple website. The website should contain at least two to three pages. It should have a table, a menu and some photograph. Also create an image map in website. Demonstrate the use of summary tags, headings, colours etc.
9. Create a simple Web application.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks

	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT515: Relational Database Management System
Credits: 4
LTP 310

Course Description: The course aims to equip the students to understand the importance of database in real world applications.
The course includes relational database concepts and transaction management concepts in database system. SQL commands.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Knowledge in the areas of database design and SQL programming.
CO2: Understand relational database technology for building applications for the current trend.
CO3: Analyze a business situation and build suitable database applications.
CO4: Describe the Concurrency Control and Physical Storage Media.

Course Content

UNIT I

Introduction: Data, Database, DBMS, File Processing System Vs DBMS-Data Independence, Data Catalog, Three schema Architecture of a database, Functional components of DBMS.
ER Model: Entity, Attributes and its Type, Entity and Relationship, Design Issues of ER Model Constraint.
Understanding the history of RDBMS, its role and importance of creating robust database, RDBMS Terminology, CODD's rule for RDBMS, Concept of Relational Model.

UNIT II

Structured Query Language (SQL): Overview of SQL, Data Definition Commands, Set operations, Aggregate function, Null values, Data Manipulation commands, Data Control commands, Views in SQL, Nested and Complex queries.
Working with SQL: triggers, use of data base triggers, database triggers Vs. SQL*forms, types of triggers, how to apply database triggers, BEFORE vs. AFTER triggers, combinations, syntax for creating and dropping triggers, Views and Packages.

UNIT III

Relational Database Design: Relational Database Design: Design guidelines for relational schema, Function dependencies.
Integrity and Security in Database: Domain Constraints, Referential integrity.
Transactions Management: Transaction concept, Transaction states, ACID properties, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of isolation.

UNIT IV

Concurrency Control: Lock-based, Timestamp-based, Validation-based protocols, Deadlock handling, Recovery System: Failure Classification, Storage structure.
Overview of Physical Storage Media: Magnetic Disks, RAID, Tertiary storage, File Organization, Organization of Records in Files, Indexing and Hashing, Ordered Indices, Static Hashing, Dynamic Hashing.
Database Security techniques and storage technique: -DAS, NAS, SAS.

Recommended Books / Suggested Readings:

1. Abraham Silberschatz, Henry F. Korth, SudharshanS, (2006), “Database System Concepts”, Fifth Edition, Tata McGraw Hill.(Unit I, IV & V).
2. Date C.J., Kannan A., Swamynathan S., (2006), “An Introduction to Database Systems”, Eighth Edition, Pearson Education.
3. RamezElmasri, Shamkant B. Navathe (2007), “Fundamentals of Database Systems”, Fourth Edition, Pearson / Addision Wesley.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT535: Relational Database Management System Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students to understand the importance of database in real world applications.
The course includes use of Structured Query Language (SQL), learn SQL syntax and PL/SQL.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Design and implement a database schema for a given problem-domain Course Outcome.
CO2: Create and maintain tables using PL/SQL.
CO3: Create and maintain tables using PL/SQL.
CO4: Develop programs using PL/SQL.

List of Practical:

1. TABLE CREATION: a) Create table CUST based on the following details

Name	Type	Remark
CID	VARCHAR2(6)	PRIMARY KEY
CNAME	VARCHAR2(10)	
CCITY	VARCHAR2(8)	

2. Create table PROD based on the following detail

Name	Type	Remark
PID	VARCHAR2(6)	PRIMARY KEY
PNAME	VARCHAR2(10)	
PCOST	NUMBER (4,2)	
PPROFIT	NUMBER (3)	

3. Create table SALE_DETAIL based on the following details

Name	Type	Remark
CID	VARCHAR2(6)	COMPOSITE PRIMARY KEY
PID	VARCHAR2(6)	COMPOSITE PRIMARY KEY
SALE	NUMBER (3)	
SALEDT	DATE	

INSERTION AND DATA RETRIEVAL:
a) Insert and Save Records in CUST, PROD and SALE_DETAIL table.
b) Data Retrieval using SELECT-WHERE, RELATIONAL OPERATOR, ARITHMETIC OPERATOR and use of ORDERBY, DISTINCT, BETWEEN, IN, DUAL and LIKE operator.
2.FUNCTIONS:
a) Date Functions, Numeric Functions, Character Functions, Conversion Functions.
b) Group Functions, Set Functions.
4.ALTER, UPDATE, DELETE, SUBQUERY AND JOINS:
a) Use of ALTER, UPDATE, DELETE and DROP Commands.
b) Using SUBQUERY and JOINS (Equi Join, Non-Equi Join, Outer Join, Self-Join) in data retrieval.
c) Create Views, Sequences and Constraints related Query.

PL/SQL:

1. Make use of COMMIT, ROLLBACK, and SAVEPOINT in a PL/SQL Block.
2. Create a PL/SQL Script to convert temperature in Fahrenheit into Celsius, and vice versa.
3. Calculate the sum of the even integers between 1 and 100.
4. Create a PL/SQL block to find ODD or EVEN NUMBER by using Searched CASE Statements.
5. Calculate a factorial of given number by using FOR loop.
6. Program development using BUILT –IN Exceptions, USER defined Exceptions, RAISE-APPLICATION ERROR.

7. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
8. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
9. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
10. Develop programs using CURSORS-Declaring, Opening, Fetching, and Closing a Cursor, including the use of CURSOR attributes.
11. Develop Programs using BEFORE and AFTER Triggers, and INSTEAD OF Triggers.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT516: Data Mining
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the data mining. The course includes Classification, prediction and cluster analysis techniques.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Justify the need of Data Warehousing & Mining.
CO2: Identify the real-life applications where data mining can be applied.
CO3: Apply different data mining algorithms on wide range of data sets.
CO4: Describe the Spatial Data Mining, Multimedia Data Mining, Text Mining and web Mining.

Course Content

UNIT-I

Introduction: Data Mining, Data ware House, Transactional Databases, Data Mining Functionalities, Characterization and Discrimination, Mining frequent patterns, Association and correlation, Classification and Prediction, Classification of Data Mining Systems, Data Mining Task Primitive, Integration of Data Mining systems, Major issues in Data Mining, Data integration and transformation, Data reduction, Data discretization.

UNIT-II

Data Warehouse and OLAP technology: Data Warehouse, Multidimensional data Model, Data warehouse architecture, Data Warehouse implementation, LAP, Data Warehouse and data mining.

UNIT-III

Association Pattern Mining: Introduction, Frequent Pattern Mining Model, Association Rule Generation Framework, Frequent Item set Mining Algorithms, Brute Force Algorithms, Apriori Algorithm, Enumeration, Tree Algorithms, Pattern Summarization.

UNIT-IV

Mining Complex Data: Spatial Data Mining, Multimedia Data Mining, Text Mining and Mining WWW.

Recommended Books / Suggested Readings:

1. Jiawei Han and MichelineKamber Data Mining - Concepts and Techniques (Second Edition) Elsevier, 2006.
2. Soman, Divakar and Ajay Data Mining Theory and Practice PHI, 2006.
3. Charu C. Aggarwal, Data Mining: The Textbook, Springer, 2015.LTP312.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT536: Data Mining Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the data mining. The course includes Classification, prediction and cluster analysis techniques.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Identify different data mining tools used to analyze data.
CO2: Implement different data mining algorithms to analyze data.
CO3: Use effective visualization for representing data.
CO4: Implement Decision Tree.

List of Practical:

1. Study of WEKA Data Mining Tool.
2. Installation of WEKA Data Mining Tool.
3. Fundamental programming using WEKA tool.
4. Create an Employee Table with the help of Data Mining Tool WEKA.
5. To apply different kind of preprocessing techniques on given dataset.
6. To list all the categorical (or nominal) attributes and the real valued attributes using Weka mining tool.
7. Create a Weather Table with the help of Data Mining Tool WEKA.
8. To implement the Apriori Algorithm.
9. To develop a decision tree and cross validate accuracy of data set is increasing order increasing or decreasing.
10. To Construct Decision Tree for various types of data and classify it.
11. One Hierarchical clustering algorithm.
12. To demonstrate K-means clustering.

Note: Software: WEKA Tools and R tools.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks

	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT517: Internet of Things
Credits: 4
LTP 310

Course Description:
The course aims to make the students familiar with trending technology of IoT.
The course includes IoT Architectural Overview, Elements of IoT Hardware Components, IoT Application Development Solution framework for IoT applications

Course Outcomes:

After the completion of this course, the students will be able to:

CO1: Understand internet of Things and its hardware and software components
CO2: Interface I/O devices, sensors & communication modules
CO3: Remotely monitor data and control devices
CO4: Develop real life IoT based projects

Unit-I

Introduction to IoT Architectural Overview: Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

Unit-II

Elements of IoT Hardware Components: Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python /Node.js /Arduino) for Communication, Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

Unit-III

IoT Application Development Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

Unit-IV

IoT Case Studies IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

List of suggested books:

1. Vijay Madisetti, ArshdeepBahga, Ïnternet of Things, "A Hands-on Approach", University Press
2. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill 7. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT537: Internet of Things Lab
Credits: 2
LTP 002

Course Description: The course aims to make the students familiar with trending technology of IoT.

Course Outcomes:
After the completion of this course, the students will be able to:
CO1: Understand internet of Things and its hardware and software components
CO2: Interface I/O devices, sensors & communication modules
CO3: Remotely monitor data and control devices
CO4: Develop real life IoT based projects

Lab Exercises:

1. Introduction to Arduino platform and programming
2. Introduction to the electrical and electronic component.
3. Introduction to the sensors.
4. Blink the LED on Pin 13
5. Build a circuit with an external LED
6. The Potentiometer
7. The Pushbutton
8. Procedures to Reuse Code
9. Design an IOT based system

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT620: R Programming
Credits: 2
LTP 004

Course Description: The course aims to equip the students to a R programming language / software environment for statistical analysis, graphics representation and reporting.

Course Outcomes: CO Course Outcomes
CO1 Identify the key components of R programming Language.
CO2 Define the concept of data Science.
CO3 Differentiate between vectors and arrays.
CO4 Outline the usage of data frames, lists, factors, tables and R structures.
CO5 Explain the need and utilization of various visualization tools.

Course Content

UNIT-I

R Programming Fundamentals: Introduction to R, Installing R, Windows/Linux/Mac Installation, setting up Path, Using Packages, and Running R: Interactive Mode, Batch Mode, Getting Help, Startup and Shut Down.
Scalars, Vectors, Arrays and Matrices, Declarations, Recycling, Common Vector Operations, Using all () and any (), Na and Null Values, Filtering, ifelse() Function.
Matrices and Arrays: Creating Matrices, General Matrix Operations, Applying Functions to Matrix Rows and Columns, Adding & Deleting Matrix Rows and Columns, Difference Between Matrix and Vector.

UNIT-II

Lists: Creating Lists, General List Operations, Accessing List Components and Values, Applying Functions to Lists, Recursive Lists. Data Frames: Creating Data Frames, Merging Data Frames, Applying Functions to Data Frames.
Factors and Tables: Introduction, Common Functions use with Factors, Working with Tables.
R Programming Structures: Control Statements, Arithmetic and Boolean Operators, Default Values for Arguments, Return Values, Recursion.

UNIT-III

Object Oriented Programming: Concept of Classes, S3 Classes, S4 Classes, S3 Versus S4 Classes, Managing Objects.
Input/Output: Accessing Keyboard and Monitor, Reading and Writing Files, Accessing the Internet. String Manipulation: Overview of String Manipulation Functions: grep (), nchar(), paste (), sprintf(), substr(), strsplit(), regexpr(), gregexpr(), Regular expression.

UNIT-IV

Graphics: Creating Graphs, Customizing Graphs, Saving Graphs to Files, Creating 3D Plots. Debugging: Principles of Debugging, Use of Debugging Tool, Using R Programming Debugging Facilities. Simulation: Generating Random Numbers, Setting the Random Number Seed, Simulating a Linear Model, Random Sampling.

Recommended Books / Suggested Readings:

1. R for Data Science by Hadley Wickham, 1st edition, O′ Reilly publisher
2. The Book of R by Tilman M. Davies, 1st edition, No Starch Pres publisher
3. R For Dummies by Andrie de Vries, 2nd edition, John Wiley & Sons publisher
4. Discovering Statistics Using R by Andy Field, 1st edition, SAGE Publications Ltd publisher
5. The Art of R Programming by Norman Matloff, 1st edition, No Starch Press publisher

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT640: R Programming Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students to gain practical experience with basic coding concepts using R programming such as conditional statements, iteration, strings, functions etc.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Write, Test and Debug R Programs**.**
CO2: Develop applications to real time problems.
CO3: Use functions, vector, list and data frames for solving problems.
CO4: Use R for statistical Analysis.

Lab Exercises:
Students should be made to practice the various concepts learned in classroom by implementing them in the form of programs. Various programs should be practiced in the lab based on each of the following:

1. Install and configuration of R programming environment.
2. Built-in Functions in R Programming.
3. Operators
4. Control Structures
5. Matrices
6. Functions
7. Vector
8. Operations on List
9. Operations on Data Frames
10. Graphics and visualization

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks

Total	50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT610: **DevOps**
Credits: 4
LTP 310

Course Objectives: The course aims to equip the students with the concept of DevOps including the version control with git, virtualization.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the version Controls of software with Git.
CO2: Apply virtualization concept with Docker.
CO3: Apply the skills for the user profile management.
CO4: Discuss the skills for system monitoring.

UNIT I

Introduction to DevOps: DevOps, History of DevOps,Dev and Ops, DevOps definitions, DevOps and Software development Life Cycle, DevOps main objectives, Tools (Jenkins, Chef, Docker, Vagrant etc.). **Version control with Git**: Git for organization, Installing Git, Common commands. Subversion Controls/Git, working with local repositories.

UNIT II

Virtualization & Containerization: Docker Installation, working with Docker Containers, Docker Command Line Interphase, Docker Compose, Docker Hub, Docker File & Commands. Build, deploy and manage web or java application on Docker. **Software Configuration Management:** Introduction to Chef/Puppet/Ansible, Chef Distribution Kit.

UNIT III

Nexus Artifacts/ Proxy Tools: Introduction to Nexus, Installation and Configuration, Repository Management, Proxy Management, Integration with Maven.**Jenkins Framework**: Jenkins Installation, User Profile, User Management, Security Management, Plugins Management, Builds Setup, Integration with Git.

UNIT IV

System Monitoring: Introduction to Vagrant: Vagrant Terminologies, Installation of Vagrant, Vagrant Proxy Project, Vagrant hands-on. **Introduction to Nagios**, Concepts behind Nagios, Nagios Installation, Hands-on.

Recommended Books / Suggested Readings:

1. DevOps: A software architect's perspective by ingo M. Weber, Len Bass and Liming Zhu
2. Building a DevOps: Building a Culture of collaboration, Affinity and Tooling at Scale by Katherine Daniels and Jennifer Davis
3. Practical DevOps by Joakim Verona

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT630: **DevOps Lab**
Credits: 2
LTP 004

Course Objectives: The course aims to equip the students with the concept of DevOps including the Docker.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the version Controls of software with Git.
CO2: Apply virtualization concept with Docker.
CO3: Apply the skills for the user profile management.
CO4: Discuss the skills for system monitoring.

Lab Exercises:

1. To install Docker and execute basic command in Docker.
2. To build image from docker file.
3. To deploy java application into Docker.
4. To perform installation of Git and work on local and remote Git repositories.
5. To fetch and synchronize Git repository.
6. To perform basic branching and merging in Git.
7. To install Jenkins and build a job in Jenkins.
8. To create a CI/CD pipeline in Jenkins.
9. To perform continuous testing of web application using Selenium.
10. To install puppet agent and puppet master on two separate virtual machine and establish connection between them.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT611:Cyber Security
Credits: 3
LTP 300

Course Description: The course aims to equip the students to provides the basic knowledge and skills in the fundamental theories and practices of Cyber Security. The course introduces concepts of Ethical Hacking.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Elaborate the broad set of technical, social & political aspects of Cyber Security.
CO2: Appreciate the vulnerabilities and threats posed by criminals, terrorist.
CO3: Describe ethics behind hacking and vulnerability disclosure.
CO4: Demonstrate a critical understanding of the Cyber law with respect to country like India.

Course Content

UNIT I

Introduction: cyber security, history of cyber security, cyber security goals, cyber security principles, cyber security technologies, Cyber Security standards, Cyber Security Tools, Cyber Security Challenges, Cyber Security Risk Analysis.

UNIT II

Hacking concepts: Hacking, Types of Hacking/Hackers, types of attackers, what is Cybercrime, Types of cybercrime, Classifications of Security attacks (Passive Attacks and Active Attacks) Essential Terminology (Threat, Vulnerability, Target of Evaluation, Attack, Exploit). Concept of ethical hacking, Phase of Ethical Hacking, Hacktivism, Sniffing tools.

UNIT III

Password: About Password, Different types of passwords (Biometric, Pattern based Graphical password, Strong Password technique, Types of Password attacks.
Web Application Based Threats: Cross-site scripting, SQL injection, Command injection, Buffer overload, Directory traversal, Phishing scams, Zombies.

UNIT IV

Security Threats: Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce-Electronic Payment System, e- Cash, Credit/Debit Card.

Recommended Books / Suggested Readings:

1. Certified Ethical Hacker Certification Exam by William Manning.
2. Fundamentals of Cyber Security by MayankBhushan, BPB Publications.
3. Pankaj Sharma. Information Security and Cyber Laws, Kataria, S. K., & Sons.
4. Charles P. Pfleeger, Shari LawerancePfleeger, “Analysing Computer Security”, Pearson Education India.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT631: Cyber Security Lab
Credits: 2
LTP 002

Course Description: The course aims to equip the students to provides the basic knowledge and skills in the fundamental theories and practices of Cyber Security. The course introduces concepts of Ethical Hacking.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Elaborate the broad set of technical, social & political aspects of Cyber Security.
CO2: Appreciate the vulnerabilities and threats posed by criminals, terrorist.
CO3: Discuss ethics behind hacking and vulnerability disclosure.
CO4: Demonstrate a critical understanding of the Cyber law with respect to country like India.

Lab Exercises:
Students should be made to practice the various concepts learned in classroom by implementing them in the form of programs. Various programs should be practiced in the lab based on each of the following –

1. Perform an Experiment to Sniff Traffic using ARP Poisoning.
2. Demonstrate intrusion detection system using any tool (snort or any other s/w).
3. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures.
4. Study of Reconnaissance tools.
5. Perform a network Scanning using any tool.
6. Demonstrate the Gaining Access to a target/remote system.
7. Maintaining Access in the target system
8. Clearing Track after exploitation.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT612: Cryptography and Network Security
Credits: 3
LTP 300

Course Objectives:
The course aims to equip the students with theory and practice of network security and cryptography.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:

CO1: Define and illustrate network security concepts and principles**.**
CO2: Classify the symmetric encryption techniques.
CO3: Apply appropriate techniques to solve network security threats.
CO4: Evaluate system security using network security controls**.**

Course Content

UNIT I

Introduction: Computer Security Concepts, the OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security.
Cryptography: Symmetric Encryption, Message Confidentiality, Public-Key Cryptography and Message Authentication Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Random and Pseudorandom Numbers, Stream Ciphers and RC4, Cipher Block Modes of Operation. Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures.

UNIT II

Key Distribution and User Authentication, Transport Level Security, HTTPS and SSH Symmetric Key Distribution Using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption, X.509 Certificates, Public-Key Infrastructure. Web Security Considerations, Secure Socket Layer and Transport Layer Security, Transport Layer Security, HTTPS, Secure Shell (SSH).

UNIT III

Wireless Network Security: Overview of IEEE 802.11 WLAN, IEEE 802.11i Wireless LAN Security.
E-MAIL & IP Pretty Good Privacy, S/MIME, IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations.

UNIT IV

System Security and Malicious Software Intruders, Intrusion Detection, Password Management, Types of Malicious Software, Viruses, Virus Countermeasures, Worms, Distributed Denial of Service Attacks, The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations.

Recommended Books / Suggested Readings:

1. William Stallings, Network Security Essentials: Applications and Standards", 4th Edition, Pearson Education, 2011.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security: Private communication in a public world", Second Edition, Pearson India Education, 2017.
3. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
4. Nina Godbole, "Information Systems Security", Wiley Publication, 2009.
5. Nirbhay Chaubey, "Securing AODV Routing Protocol in Design of Mobile Ad-Hoc Networks: LAP Lambert Academic Publishing,2015
6. Bruce Schneier "Applied Cryptography: Protocols, Algorithms, and Source Code in C", Wiley India,1996

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT632: Cryptography and Network Security Lab
Credits: 2
LTP 002

Course Description: To give practical exposure on basic security attacks, encryption algorithms, authentication techniques. Apart from security algorithms, firewall configuration is also introduced.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Identify basic security attacks and services.
CO2: Use symmetric and asymmetric key algorithms for cryptography.
CO3: Make use of Authentication functions

Lab Exercises:

1. Implementation of Caesar Cipher technique
2. Implement the Play fair Cipher
3. Implement the Pure Transposition Cipher
4. Implement DES Encryption and Decryption
5. Implement the AES Encryption and decryption
6. Implement RSA Encryption Algorithm
7. Implementation of Hash Functions

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks

Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT606: Advanced Java Programming
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of Advanced Java Programming.
The course includes design and develop applications -Using Java Technology.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Use of input, output and stream objects and will use them for file processing as well as client/server communications tasks.
CO2: Develop web application using Java Servlet.
CO3: Interact with databases using JDBC.
CO4: Describe the advanced concepts such as RMI and Spring Framework and Hibernate.

Course Content

UNIT-I

Web Applications in java: Introduction to web applications, Benefits of web applications, Web Architecture Models. Socket Programming: Client/Server Communication, distributed Client Server model, Java Socket Programming, Sockets and Socket-based Communication, TCP/IP Socket Programming Socket Programming.

UNIT-II

Introduction to JDBC: Introducing JDBC, communicating with database: obtaining connection, creating jdbc statement object, executing SQL statement, closing connection. Creating DSN, understanding various JDBC drivers. Creating table by using JDBC, types of statements: statement, prepared statement, callable statement, working with result set.
Multithreading: Introduction to Thread, Life cycle of thread, Thread Creation - By using Thread Class - By Using Runnable interface, Priorities and Synchronization, Inter thread communication, Implementation of Thread with Applet.

UNIT-III

Servlet: Introduction, How It differ from CGI, Types of servlet, Life cycle of servlet, Execution process of Servlet Application, Session Tracking, Cookie class, Servlet- Jdbc.
Remote Method Invocation: Introduction to remote object RMI architecture, Stubs and skeleton, Registry, Setting up RMI.

UNIT-IV

Spring Framework and Hibernate: Overview, Benefits of Using the Spring Framework, Architecture, Bootstrapping Spring framework, Configuring Spring framework, Data Persistence, Object/relational Mapping, Hibernate ORM, Hibernate architecture, Mapping Entities to Tables.

Recommended Books / Suggested Readings:

1. Java-The Complete Reference, Herbert Schildt, Tenth Edition, Tata McGraw Hill.
2. Core Java- An Integrated Approach, R. Nageswara Rao, DreamTech Press.
3. Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
4. Christian Bauer, Gavin King, Gary Gregory, Java Persistence with Hibernate, 2015.
5. Craig Walls, Spring in Action Paperback, Manning Publications, 2014.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks

	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT626: Advanced Java Programming Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of Advanced Java Programming. The course includes design and develops applications -Using Java Technology.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Use of input, output and stream objects and will use them for file processing as well as client/server communications tasks.
CO2: Develop web application using Java Servlet and Java Server Pages technology.
CO3: Develop sophisticated, interactive user interfaces using the Java Swing technology.
CO4: Learn to interact with databases using JDBC.

List of Practical:

1. Write a program to implement Multithreading
2. Write a program to implement client server communication.
3. Write a program to implement Uniform Resource Locator.
4. Write a program to implement InetAddress.
5. Write a program to sending e-mail in java.
6. Write a Chat Program Java: Chat communication.
7. Write a Java program to implement Swing components.
8. Write a Program that displays two textboxes for entering a students' Roll-no and Name with appropriate labels and buttons using java swing.
9. Write a Java program to implement Calculator using java Swing.
10. Write a program to create GUI component of Online exam site using swing without database.
11. Write a program to create login form with database.
12. Create Servlet file which contains following functions:1. Connect 2. Create Database 3. Create Table 4. Insert Records into respective table 5. Update records of particular table of database 6. Delete Records from table. 7. Delete table and also database.
13. User can create a new database and also create new table under that database. Once database has been created then user can perform database operation by calling above functions. Use following Java Statement interface to implement program:1. Statement 2. Prepared statement 3. Callable statement.
14. Write a program to insert data into table using JSP.
15. Write a program to show validation of user using JSP.
16. Write a program to display message on browser using JSP.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks

Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT619: Data Analytics

Credits: 4
LTP 310

Course Description: The course aims to make familiar with the systematic computational analysis of data or statistics. It is used for the discovery, interpretation, and communication of meaningful patterns in data. It also entails applying data patterns toward effective decision-making.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the concepts of Data Analytics.
CO2: Demonstrate the analytical techniques used in decision making.
CO3: Describe the Data analytics using SQL.
CO4: Demonstrate Data Analytics using MS Excel.

Course Content

UNIT I

Introduction: Data Science and Data Analytics, features; Preprocessing on data; Cleaning of data; A Short Taxonomy of Data Analytics; Feature selection techniques like Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA); Components of Analytics - reporting and analysis. Handling Data Sources Different types of data sources: structured, unstructured and semi-structured data; Relational databases: normal forms, transactional data, Structured Query Language (SQL); NoSQL databases and its types.

UNIT II

Data Analytics using MS Excel: Basic data analytics operations in MS Excel like sort, filter, conditional filtering, charts, pivot tables, tables, what-if analysis, solver, analysis toolpak; Binary classification in MS Excel.

UNIT III

Learning with data: AUC (Area under the receiver operating characteristic (ROC) curve, information measures using entropy, linear regression, basics of macros and VBA in excel. Advance topics of data analytics using excel like power pivot table, power query for data, importing data using excel. Industry use cases from data science like market basket analysis.

UNIT IV

Data analytics using SQL: Basic data analytics operations in SQL like sort, filter, conditional filtering, charts, pivot tables, tables, what-if analysis, solver, analysis toolpak; Data mining models in SQL; association rules in SQL; linear regression in SQL; AUC and RoC in SQL; Unstructured data analysis in SQL.

Recommended Books / Suggested Readings:

1. Data Analytics Made Accessible by Dr. Anil Maheshwari
2. Numsense! Data Science for the Layman: No Math Added by Annalyn Ng and Kenneth Soo
3. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking by Foster Provost and Tom Fawcett
4. The Hundred-Page Machine Learning Book by AndriyBurkov
5. Data Analysis Using SQL and Excel, 2nd Edition by Gordon S. Linoff (2015), Wiley publication.
6. Microsoft Business Intelligence Tools for Excel Analysts 1st Edition by Michael Alexander, Jared Decker and Bernard Wehbe.
7. A general introduction to Data Analytics, Joao Moreira, Andre de Carvalho, Tomas Horvath, Wiley Publictaion.
8. Microsoft Excel 2007, Custom Guide Inc, 2007

9. Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT639: Data Analytics Lab

Credits: 2
LTP 002

Course Description: The course aims to make familiar with the systematic computational analysis of data or statistics. It is used for the discovery, interpretation, and communication of meaningful patterns in data. It also entails applying data patterns toward effective decision-making.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Describe the concepts of Data Analytics.
CO2: Demonstrate the analytical techniques used in decision making.
CO3: Describe the Data analytics using SQL.
CO4: Demonstrate Data Analytics using MS Excel.

Lab Exercises:

1. Prepare an excel sheet to perform the following statistical analysis
    a. Find mean of the values
    b. Find mode of the values
    c. Calculate standard deviation
    d. Find largest and smallest values
2. Draw different types of charts for weather analysis of 5 successive years
3. Prepare an excel sheet for creating a pie chart for budget analysis
4. Prepare an excel sheet to illustrate the sorting, filtering, sub totals.
5. Prepare an excel sheet for restricting data entry using data validation feature
6. Create and demonstrate to analyze the data using a pivot table
7. Implement Binary classification in MS Excel,
8. Implement AUC (Area under the receiver operating characteristic (ROC) curve in Excel
9. Explore information measures using entropy in Excel
10. Implement linear regression in Excel
11. Explore and implement basic macros in Excel
12. Explore and implement various options of VBA in excel.
13. Implement basic data analytics operations in SQL like sort, filter, conditional filtering, charts, pivot tables, tables, what-if analysis, solver, analysis toolpak.
14. Implement association rules in SQL
15. Implement linear regression in SQL
16. Implement AUC and RoC in SQL

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT613: Client/Server Computing

Credits: 4
LTP 310

Course Description: The course aims to apply the techniques and features of a client/server development language to construct a moderate application.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe a client/server network.
CO2: Describe how the hardware and software are combined to implement client/server computing.
CO3: Demonstrate the concepts of a typical client operating system.
CO4: Describe the difference between client and server hardware technology.

Course Content

UNIT I

Introduction: Client/Server Computing, Benefits of Client/Server Computing, Evolution of Client/Server Computing, Hardware Trends, Software Trends, Evolution of Operating Systems.

Overview of Client/Server Applications: Components of Client/Server Applications, Classes of Client/Server Applications, Categories of Client/Server Applications. **Understanding Client/Server Computing**: Dispelling the Myths, Obstacles Upfront & Hidden, Open Systems & Standards – Standards – Setting Organizations – Factors of Success.

UNIT II

The Client Hardware & Software: Client Component, Client Operating Systems, GUI, Database Access, Client Software Products: GUI Environments, converting 3270/5250 Screens, Database Tools, Client Requirements: GUI Design Standards, Open GUI Standards, Interface Independence, Testing Interfaces.

UNIT III

Server: Categories of Servers, Features of Server Machines, Classes of Server Machines, Server Environment: Network Management Environment, Network Computing Environment, Extensions, Network Operating System, Loadable Module.

UNIT IV

Multi-Tier Computing: Overview, Benefits, Disadvantages, Components, Tier separations and interaction. **Thin Client Computing**: Introduction to computing models – Comparison, Components, environments.

Recommended Books / Suggested Readings:

1. Patrick Smith &Steave Guengerich, “Client/Server Computing”. PHI ,2001
2. Dawna Travis Devire, “Client/Server Computing”. TMH
3. Larry J Vaughn, “Client/Server System Design and implementation”, McGraw Hill inc, USA, 1995

Course Assessment Pattern:

Criteria	Description	Maximum Marks

Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT633: Client/Server Computing Lab

Credits: 2
LTP 002

Course Description: The course aims to apply the techniques and features of a client/server development language to construct a moderate application.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe a client/server network.
CO2: Describe how the hardware and software are combined to implement client/server computing.
CO3: Demonstrate the concepts of a typical client operating system.
CO4: Describe the difference between client and server hardware technology.

Lab Exercises:

1. To study various Networking commands.
2. Socket Program for Echo/Ping/Talk commands.
3. File transfer from one machine to another machine in a network.
4. To study Remote Command Execution.
5. To study the creation of a socket (UDP).
6. To study ARP by simulation.
7. To download web page on a machine.
8. Implementation of the TCP Module.
9. Implementation of RMI.
10. Implementation of Client in C Server in Java.
11. Case study of routing algorithms.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks

	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT607: Artificial Intelligence
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the Artificial Intelligence. The course includes basic decision-making algorithms, including search based and problem-solving techniques, and first-order logic.
Upon successful completion of this course, students will be able to
CO1: Demonstrate fundamental understanding of artificial intelligence (AI).
CO2: Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
CO3: Attain the capability to represent various real-life problem domains.
CO4: Discuss the concepts of NLP and Pattern Recognition.
Course Content

UNIT-I

Overview of A.I: Introduction to AI, Importance of AI, Foundations of artificial intelligence, AI and its related field, AI techniques, Criteria for success.
Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.
Heuristic search techniques: Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction.

UNIT-II

Knowledge representation: Definition and importance of knowledge, Knowledge presentation, various approaches used in knowledge representation, Issues in knowledge representation.
Using Predicate Logic: Representing Simple Facts in logic, representing instances and is-a relationship, Computable function and predicate.

UNIT-III

Natural language processing: Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing.
Learning: Introduction learning, Rote learning, learning by taking advice, learning in problem solving, learning from example-induction, Explanation based learning

UNIT-IV

Pattern Recognition: Recognition and Classification Process-Decision Theoretic Classification, Syntactic Classification; Learning Classification Patterns, Recognizing and Understanding Speech.
Expert System: Introduction, Representing using domain specific knowledge, Expert system shells. LISP and other AI Programming Language

Recommended Books / Suggested Readings:

1. E. Rich and K. Knight, “Artificial intelligence", TMH, 2nd ed., 1999.
2. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1999.
3. Nils J Nilsson, “Artificial Intelligence-A new Synthesis" 2nd Edition (2000), Harcourt Asia Ltd.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks

End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT627: Artificial Intelligence Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the Artificial Intelligence. The course includes basic decision-making algorithms, including search based and problem-solving techniques, and first-order logic.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:

CO1: Develop simple applications using AI tools.
CO2: Attain the capability to represent various real-life problem domains using logic-based techniques and use this to perform inference or planning.
CO3: Apply basic principles of AI in solutions that require problem solving.
CO4: Demonstrate awareness and a fundamental understanding of various applications of AI.

List of Practical:

1. Write a python program to print the multiplication table for the given number.
2. Write a python program to check whether the given number is prime or not.
3. Write a python program to find factorial of the given number.
4. Write a python program to implement simple Chatbot.
5. Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing).
6. Write a python program to implement List methods (Add, Append, Extend & Delete).
7. Write a python program to Illustrate Different Set Operations.
8. Write a python program to generate Calendar for the given month and year.
9. Write a python program to implement Simple Calculator program.
10. Write a python program to Add Two Matrices.
11. Write a python program to Transpose a Matrix.
12. Write a python program to implement Breadth First Search Traversal.
13. Write a python program to implement Water Jug Problem.
14. Write a python program to remove punctuations from the given string.
15. Write a python program to sort the sentence in alphabetical order.
16. Write a program to implement Hangman game using python.
17. Write a program to implement Tic-Tac-Toe game using python.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given)	15 Marks

	• Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT614: Object Oriented Analysis and Design
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of Object-Oriented Analysis and Design

Course Outcomes (CO):

Upon successful completion of this course, students will be able to

CO1: Express software design with UML diagrams
CO2: Design software applications using OO concepts.
CO3: Identify various scenarios based on software requirements
CO4: Transform UML based software design into pattern-based design using design patterns.
CO5: Understand the various testing methodologies for OO software

Course Content

UNIT-I

Unified Process and Use Case Diagrams: Introduction to OOAD with OO Basics, Unified Process, UML diagrams, Use Case, Case study, the Next Gen POS system, Inception, use case Modelling, Relating Use cases: include, extend and generalization.

UNIT II

Static UML Diagrams: Class Diagram, Elaboration, Domain Model, finding conceptual classes and description classes, Associations, Attributes, Domain model refinement, finding conceptual class Hierarchies, Aggregation and Composition - Relationship between sequence diagrams and use cases.

UNIT III

Dynamic Diagrams: UML interaction diagrams, System sequence diagram, Collaboration diagram, use of Communication Diagrams, State machine diagram and Modelling, use of State Diagrams, Activity diagram, use of activity diagrams

Implementation Diagrams - UML package diagram- When to use package diagrams - ComponentandDeploymentDiagrams–WhentouseComponentandDeploymentdiagrams

UNIT IV

Design Patterns: GRASP: Designing objects with responsibilities, Creator, Information expert, Low Coupling, High Cohesion, Controller. Design Patterns, creational, factory method, structural, Bridge, Adapter, behavioral, Strategy, observer, Applying GoF design patterns, Mapping design to code.

Recommended Books / Suggested Readings:

1. Craig Arman, ―Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, PearsonEducation,2005.
2. AliBahrami-Object Oriented Systems Development -McGrawHillInternationalEdition-1999
3. Erich Gamma and Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable Object-Oriented Software‖, Addison-Wesley,1995.
4. Martin Fowler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Language‖, Third edition, Addison Wesley,2003.

Course Assessment Pattern:

Criteria	Description	Maximum Marks

Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT634: Object Oriented Analysis and Design Lab
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of Object-Oriented Analysis and Design

Course Outcomes (CO):

Upon successful completion of this course, students will be able to

CO1: Capture the requirements specification for an intended software system

CO2: Implement the process to draw the UML diagrams for the given specification

CO3: Design the model properly to code

CO4: Test the software system for the scenarios

List of Practical:

1. Identify a software system that needs to be developed.

2. Document the Software Requirements Specification (SRS) for the identified system.

3. Identify use cases and develop the Use Case model.

4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.

5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams 6. Draw relevant State Chart and Activity Diagrams for the same system.

7. Implement the system as per the detailed design

8. Test the software system for all the scenarios identified as per the use-case diagram

9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.

10. Implement the modified system and test it for various scenarios.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given) • Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	15 Marks
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks

Total	50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT608: Data Sciences
Credits: 4
LTP 310

Course Description: The course aims to equip the students with a comprehensive study of the Introduction to Data Sciences.
The course includes Data Visualization, R programming.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Explain data science and its fundamentals.
CO2: Provide data science solution to business problems and visualization.
CO3: Apply principles of Data Science to the analysis of business problems.
CO4: Demonstrate proficiency with statistical analysis of data.

Course Contents

UNIT-I

Introduction to Data Science: Definition, working, benefits and uses of Data Science, Data science vs BI, The data science process, Role of a Data Scientist.

UNIT-II

Data Scientist's Toolbox: Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software: version control, markdown, git, GitHub, R, and RStudio.
R Programming Basics: Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling.

UNIT-III

Getting and Cleaning Data: Obtaining data from the web, from APIs, from databases and from colleagues in various formats, basics of data cleaning and making data tidy.
Data Visualization: basics, techniques, types, applications, tools, Data Journalism, Interactive dashboards.

UNIT-IV

Exploratory Data Analysis: Essential exploratory techniques for summarizing data, applied before formal modeling commences, eliminating or sharpening potential hypotheses about the world that can be addressed by the data, common multivariate statistical techniques used to visualize high-dimensional data.

Recommended Books / Suggested Readings:

1. D. Cielen, Arno D. B. Meysman, M. Ali, Introducing Data Science, Dreamtech Press.
2. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontiline" by Schroff/O'Reilly, 2013.
3. Foster Provost, Tom Fawcett, "Data Science for Business" What You Need to Know About Data Mining and Data-Analytic Thinking" by O'Reilly, 2013.www.w3schools.com.
4. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley &Sons, 2013.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks

Total	100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.

BIT628: Data Sciences Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students with a comprehensive study of the Introduction to Data Sciences.
The course includes new language R used for data science.
Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Install and use R for simple programming tasks.
CO2: Use R Graphics and Tables to visualize results of various statistical operations on data.
CO3: Apply the knowledge of R gained to data Analytics.
CO4: Apply R programming for problem solving.

List of Practical:

1. Installation of R programming language.
2. Write a program that prints „Hello World„ to the screen.
3. Write a program that asks the user for a number n and prints the sum of the numbers 1to n.
4. Write a program that prints a multiplication table for numbers up to 12.
5. Write a function that returns the largest element in a list.
6. Write a function that computes the running total of a list.
7. Write a function that tests whether a string is a palindrome.
8. Implement linear search.
9. Implement binary search.
10. Implement matrices addition, subtraction and Multiplication.
11. Fifteen students were enrolled in a course. There are ages were20 20 20 20 20 21 21 21 22 22 22 22 23 23 23

    a. Find the median age of all students under 22 years

    b. Find the median age of all students.

    c. Find the mean age of all students.

    d. Find the modal age for all students.

    e. Two more students enter the class. The age of both students is 23. What is now mean, mode and median?

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given)	15 Marks

	• Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT615: **System Programming**
Credits: 4
LTP 310

Course Description: The course aims to equip the students to Develop complex applications using asynchronous programming techniques. The course includes to writing code that prioritizes operating system support for programmers.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the basic system concepts.
CO2: Display proficiency in the use of programming languages like C.
CO3: Describe the fundamentals of concurrent programming.
CO4: Describe the concepts of Linker and Loaders and compilers.

Course Content

UNIT I

Overview of System Software: Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, System Software Development, Recent Trends in Software Development, Levels of System Software. **Overview of Language Processors**: Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language, Processing, Symbol Tables.

UNIT II

Assemblers: Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86. **Macro and Macro Processors**: Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a Macro Preprocessor, Functions of a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors.

UNIT III

Linker and Loaders: Introduction, Relocation of Linking Concept, Design of a Linker, Self-Relocating Programs, Linking in MSDOS, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linker's v/s Loaders. **Scanning and Parsing**: Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top-Down Parsing, Bottom-up Parsing, Language Processor Development Tools, LEX, YACC.

UNIT IV

Compilers: Types of Compilers, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization. **Interpreters & Debuggers**: Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger.

Recommended Books / Suggested Readings:

1. System Programming by D M Dhamdhere McGraw Hill Publication
2. System Programming by Srimanta Pal OXFORD Publication
3. System Programming and Compiler Construction by R.K. Maurya& A. Godbole.
4. System Software – An Introduction to Systems Programming by Leland L. Beck, 3rd Edition,
5. Pearson Education Asia
6. System Software by Santanu Chattopadhyay, Prentice-Hall India,2007

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks

	Assignment	5 Marks
	Continuous Assessment Test	10 Marks
	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT635: System Programming Lab
Credits: 2
LTP 004

Course Description: The course aims to equip the students to Develop complex applications using asynchronous programming techniques. The course includes to writing code that prioritizes operating system support for programmers.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the basic operating system concepts.
CO2: Use of system programming languages to develop complex applications.
CO3: Describe the fundamentals of concurrent programming.
CO4: Discuss the Recursive and Predictive Parsing.

Lab Exercises:

1. Write a program to implement the lexical analyzer.
2. Write a Lexical Analyzer (using lex utility for UNIX).
3. Write a program to left factor the given grammar.
4. Write a program to remove the Left Recursion from a given grammar.
5. Aim: Implement Recursive Descendent Parsing for the given Grammar.

E -> T + E / T

T -> F * T / F

F ->(E) / i

6. Implement Predictive Parser for the given grammar.

E -> T + E / T

T -> F * T / F

F ->(E) / i

7. Write a SAL program in text file and generate SYMTAB and LITTAB
8. Use macro features of C language
9. Write a program which generates Quadruple Table for the given postfix String
10. Write a C program to parse a given string using Predictive parsing for given grammar.

type → simple | ↑id | array [simple] of type simple → integer | char | numdotdotnum

11. Write a program that displays a different message based on time of day. For example, page should display "Good Morning" if it is accessed in the morning.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given)	15 Marks

	• Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT616: Machine Learning
Credits: 4
LTP 310

Course Description: The course aims to equip the students to design and analyses various machine learning algorithms and technique. The course introduces supervised and unsupervised learning paradigms of machine learning.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe machine learning concepts and range of problems that can be handled by machine learning.
CO2: Recall the concept of clustering.
CO3: Differentiate supervised and unsupervised learning.
CO4: Describe the concept of Reinforcement learning.

Course Content

UNIT I

Overview: foundations, scope, problems, and approaches of Intelligent agents: reactive, deliberative, goal-driven, utility-driven, learning agents, Artificial Intelligence programming techniques. **Problem-solving through Search:** forward and backward, state-space, blind, heuristic, problem-reduction, A, A*, AO*, minimax, constraint propagation, neural, stochastic, and evolutionary search algorithms, sample applications.

UNIT II

Introduction: Machine Learning, Characteristics of modern Machine Learning, why use Machine learning, Types of Machine Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Machine Learning Process Flow. **Supervised Learning:** Supervised learning, types of supervised learning: classification, Regression. Basic Methods: Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression. Support Vector Machines, Illustration how Support Vector Machine works, Implementation of Support Vector Machine for Classification.

UNIT III

Unsupervised Learning: Clustering, K-means Clustering, how does K-means algorithm work, C-means Clustering, Hierarchical Clustering, How Hierarchical Clustering works.

UNIT IV

Reinforcement learning: Reinforcement Learning, Elements of Reinforcement Learning, Epsilon Greedy Algorithm, Markov Decision Process (MDP).

Recommended Books / Suggested Readings:

1. Machine Learning by Tom M. Mitchell. 2014 Reprint. McGraw-Hill Science.
2. Reinforcement Learning: An Introduction by Richard S Sutton and Andrew G. Barto. (2016). MIT Press.
3. Understanding Machine Learning: From Theory to Algorithms by ShaiShalev-Shwartz (2015).
4. Simpler: Using Machine Learning Algorithms in R by Darrin Thomas (2017).
5. Introduction to Machine Learning by Ethem Alpaydin. PHI Publisher.
6. Machine Learning, A practical approach on the statistical learning theory by Rodrigo fernandes de Mello and Moacir Antonelli Ponti.

Course Assessment Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Semester Exam (MSE)	20 Marks
	Assignment	5 Marks
	Continuous Assessment Test	10 Marks

	Attendance	5 Marks
End Term Exam (Summative)	End Term Examination (ESE)	60 Marks
Total		100 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

BIT636: Machine Learning Lab
Credits: 2
LTP 004

Course Description: The course aims to understand the concepts of Machine concepts using Python. The course includes techniques of machine learning using python.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Describe the List, Tuples and Dictionaries in Python.
CO2: Express different Decision-Making statements and Functions.
CO3: Interpret Object oriented programming in Python
CO4: Summarize different File handling operation.
CO5: Design and develop Machine learning techniques using Python.

Lab Exercises:

1. Python Programs based on Operators and Expressions.
2. Python Programs based on if and else if statements.
3. Python Programs based on loops.
4. Python Programs based on Sequences and File Operations.
5. Python Programs based on Working with Files.
6. Python Programs based on Errors and Exception Handling.
7. Python Programs based on Dictionaries and Sets.
8. Python Programs based on Using Modules.
9. Python Programs based on Regular Expressions.
10. Python Programs based on Object Oriented Programming.
11. Projects uses various Machine learning techniques:
    a) Social Media Sentiment Analysis.
    b) Sales Forecasting.
    c) Weather Prediction.
    d) Diabetes Prediction.
    e) Smart attendance System (Face recognition).
    f) Text to speech.
    g) Any Other.

Lab Assessment Evaluation Pattern:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Lab Evaluation (Five times a semester): Based on following criteria: • Problem solving (Based on difficulty level, one or more questions may be given)	15 Marks

	• Flowchart / Algorithm / Structured description of problem to explain how the problem can be solved / Interface Design	
	Internal viva	5 Marks
	Attendance	5 Marks
	Practical File	5 marks
External Assessment (Summative)	External Viva	20 Marks
Total		50 Marks
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	