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Vill. Sri Hargobindgarh, Hoshiarpur Road,
Phagwara, Punjab 144401
Phone no. 01824-504999

Ref. No. GU/FEDA/ET/21-22/149 Dated: 30-05-2022

NOTIFICATION

A meeting of the Board of Studies of Department of Computer Science & Engineering, Faculty of Engineering Design and Automation has been scheduled on **8th June 2022** at **10.00 AM** in Meeting Room, Block A of the University to deliberate on the agenda given below:

Agenda Item:

Item No. 1: To discuss and recommend Program Ordinances of M. Tech (CSE), and B. Tech (CSE).

Item No.2: To deliberate and recommend the Program Ordinance, Scheme and Syllabus of M. Tech (CSE), and B. Tech (CSE) to be implemented from the Academic Session 2022-23 as recommended by University Grants Commission (UGC).

Item No. 3: To recommend the number of seats for M. Tech (CSE), and B. Tech (CSE).

Item No.4: To approve the names of sub-committee members.

Item No. 5: To approve the recommendations of sub-committee members and authorize for any discrepancies left or minor changes if found duly to be approved by chairman of BoS.

Item No. 6: Any other item with the permission of Chair

Members:

1. Dr. Vikrant Sharma, Dean, Faculty of Engineering, Design and Automation, GNA University, Phagwara (Chairperson)
2. Dr. Mala Kalra, Assistant Professor (CSE), NITTTR, Chandigarh (External Expert)
3. Er. Vipin Gupta, Unet Solutions, Moga (External Expert)
4. Mr. Abhir Naik, Operations Support Analyst, Palo Alto Networks, India (Online), (External Expert)
5. Mr. Lokesh Mehra, Head - AWS Academy, South Asia (Online), (External Expert)
6. Dr. Monika Hanspal, Dean (Academics), GNA University, Phagwara
7. Dr. Anurag Sharma, Professor and Head, CSE, Faculty of Engineering, Design and Automation, GNA University, Phagwara
8. Dr. Hitesh Marwaha, Associate Professor and Head, FCS, GNA University, Phagwara (Vice-Chancellor Nominee)
9. Mr. Yogesh Bhalla, Assistant Professor and Head (FNS), GNA University, Phagwara (Special Invitee from Another Dept.)
10. Dr. Sumit Chopra, Associate Professor, CSE, Faculty of Engineering, Design and Automation, GNA University, Phagwara
11. Er. Inderjit Singh, Assistant Professor, CSE, Faculty of Engineering, Design and Automation, GNA University, Phagwara
12. Er. Neeta Rana, Assistant Professor, CSE, Faculty of Engineering, Design and Automation, GNA University, Phagwara

Chairperson

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cc: Honorable Vice Chancellor, GNA University
Registrar, GNA University
Members

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Department of Computer Science and Engineering

Faculty of Engineering Design and Automation

Date: June 8, 2022

Attendance Sheet, BoS-2022

S.NO	Name	Designation	Signature
1.	Prof. (Dr.) Vikrant Sharma	Professor and Dean, FEDA, GNA University, Chairperson	
2.	Dr. Mala Kalra	Assistant Professor, NITTTR, Chandigarh, External Expert	
3.	Er. Vipin Gupta	Unet Solutions, Moga, External Expert	
4.	Mr. Abhir Naik	Palo Alto Networks, India, (Online), External Expert	—
5.	Mr. Lokesh Mehra	AWS Academy, South Asia (Online), External Expert	—
6.	Dr. Monika Hanspal	Dean, Academics, GNA University	
7.	Dr. Anurag Sharma	Professor and Head, CSE, FEDA, GNA University	
8.	Dr. Hitesh Marwaha	Associate Professor and Head (FCS), GNA University, (Vice-Chancellor Nominee)	
9.	Mr. Yogesh Bhalla	Assistant Professor and Head (FNS), GNA University, Phagwara (Special Invitee from Another Dept.)	
10.	Dr. Sumit Chopra	Associate Professor, CSE, FEDA, GNA University	
11.	Er. Inderjit Singh	Assistant Professor, CSE, FEDA, GNA University	
12.	Er. Neeta Rana	Assistant Professor, CSE, FEDA, GNA University	

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Ref No: GU/FEDA/ET/21-22/149-A Date: 8/6/22

MINUTES OF MEETING OF BOARD OF STUDIES

Board of Studies (BOS) was held for the department of Computer Science and Engineering, Faculty of Engineering, Design & Automation, for the academic session 2022-23 on June 8, 2022.

The Chairperson welcomed all the members present in the BOS meeting and the following points were discussed with the experts from academia and industry. After deliberate discussion, the Board of Studies recommended the Structure, Schemes and Syllabus of the program with the following suggestions.

Item No.	Points of Discussion	Resolution
1.	To discuss and recommend Program Ordinances of: • B.Tech. (CSE) • M.Tech (CSE)	The members discussed respective Program Ordinances for the Programs and modified the same which is marked as **Annexure- I** and attached herewith.
2.	To deliberate and recommend the Program Design, Schemes and Syllabus of: • B.Tech. (CSE) • M.Tech (CSE)	The members discussed respective Program Design, Scheme and Syllabus for Academic Session 2022-23 and the recommendations have been implemented by the committee and attached along as **Annexure- II**.
3.	To recommend the Number of Seats for: • B. Tech (CSE) • M.Tech (CSE)	Seat Matrix recommended by the committee is attached in **Annexure-III.**
4.	To approve the recommendations of subcommittee members and authorize for any discrepancies left or minor changes (if found) duly to be approved by chairman of BoS	The members approved the provision of subcommittee of CSE/Faculty of Engineering, Design and Automation which will be authorize for any discrepancies left or minor changes (if found). The committee is attached in **Annexure-IV.**

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5.	Changes in Examination Pattern	Found Satisfactory
6.	Change in Teaching Pedagogy	Found Satisfactory
7.	Any other Suggestion(s)	Nil

Signature(s):

Dr. Vikrant Sharma Chairperson Dean, FEDA	Dr. Monika Hanspal Dean, Academics	Dr. Anurag Sharma Professor & Head, CSE	Dr. Mala Kalra External Expert (Academia)
Er. Vipin Gupta External Expert (Industry)	Dr. Hitesh Marwaha Associate Professor & Head, FCS	Dr. Sumit Chopra Associate Professor, CSE, FEDA	Er. Inderjit Singh AP, CSE, FEDA
Er. Neeta Rana AP, CSE, FEDA	Mr. Abhir Naik External Expert (Industry) —Online—	Mr. Lokesh Mehra External Expert (Industry) —online—	Mr. Yogesh Bhalla (Special Invitee)

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Annexure-I

Notification for the Approval of the Program Ordinance

The committee members discussed and recommended the attached Program ordinance for the following programs for the upcoming academic session (2022 onwards).

S. No.	Program
1.	M.Tech (CSE)
2.	B.Tech. (CSE)

Signature(s):

Dr. Vikrant Sharma Chairperson Dean, FEDA	Dr. Monika Hanspal Dean, Academics	Dr. Anurag Sharma Professor & Head, CSE	Dr. Mala Kalra External Expert (Academia)
Er. Vipin Gupta External Expert (Industry)	Dr. Hitesh Marwaha Associate Professor & Head, FCS	Dr. Sumit Chopra Associate Professor, CSE, FEDA	Er. Inderjit Singh AP, CSE, FEDA
Er. Neeta Rana AP, CSE, FEDA	Mr. Abhir Naik External Expert (Industry) — online —	Mr. Lokesh Mehra External Expert (Industry) — online —	Mr. Yogesh Bhalla (Special Invitee)

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Annexure-II

Notification for the Approval of the Program Design, Scheme and Syllabus

The committee members deliberated and recommend the attached Program Design, Scheme and Syllabus for the following programs for the upcoming academic session (2022 onwards).

S. No.	Program
1.	M.Tech (CSE)
2.	B.Tech. (CSE)

Signature(s):

Dr. Vikrant Sharma Chairperson Dean, FEDA	Dr. Monika Hanspal Dean, Academics	Dr. Anurag Sharma Professor & Head, CSE	Dr. Mala Kalra External Expert (Academia)
Er. Vipin Gupta External Expert (Industry)	Dr. Hitesh Marwaha Associate Professor & Head, FCS	Dr. Sumit Chopra Associate Professor, CSE, FEDA	Er. Inderjit Singh AP, CSE, FEDA
Er. Neeta Rana AP, CSE, FEDA	Mr. Abhir Naik External Expert (Industry) —online—	Mr. Lokesh Mehra External Expert (Industry) —online—	Mr. Yogesh Bhalla (Special Invitee)

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Annexure-III

Programme wise Seat Matrix in M. Tech (CSE) & B.Tech (CSE)

S. No	Course	Number of Seats
1.	M.Tech (CSE)	10
2.	B. Tech (CSE)	150

Signature(s):

Dr. Vikrant Sharma Chairperson Dean, FEDA	Dr. Monika Hanspal Dean, Academics	Dr. Anurag Sharma Professor & Head, CSE	Dr. Mala Kalra External Expert (Academia)
Er. Vipin Gupta External Expert (Industry)	Dr. Hitesh Marwaha Associate Professor & Head, FCS	Dr. Sumit Chopra Associate Professor, CSE, FEDA	Er. Inderjit Singh AP, CSE, FEDA
Er. Neeta Rana AP, CSE, FEDA	Mr. Abhir Naik External Expert (Industry)	Mr. Lokesh Mehra External Expert (Industry)	Mr. Yogesh Bhalla (Special Invitee)

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Annexure-IV
Sub-Committee of CSE, FEDA

The list of sub-committee members approved by the committee to authorize if any discrepancies left or minor changes found in ordinance or scheme.

S.No	Name	Designation	Role
1.	Dr. Vikrant Sharma	Professor and Dean, FEDA, GNA University	Chairperson
2.	Dr. Anurag Sharma	Professor and Head, CSE/FEDA, GNA University	Member
3.	Dr. Sumit Chopra	Associate Professor, CSE/FEDA, GNA University	Member
4.	Mr. Inderjit Singh	Assistant Professor, CSE/FEDA, GNA University	Member
5.	Er. Neeta Rana	Assistant Professor, CSE/FEDA, GNA University	Member

Signature(s):

Dr. Vikrant Sharma Chairperson Dean, FEDA	Dr. Monika Hanspal Dean, Academics	Dr. Anurag Sharma Professor & Head, CSE	Dr. Mala Kalra External Expert (Academia)
Er. Vipin Gupta External Expert (Industry)	Dr. Hitesh Marwaha Associate Professor & Head, FCS	Dr. Sumit Chopra AP, CSE, FEDA	Er. Inderjit Singh AP, CSE, FEDA
Er. Neeta Rana AP, CSE, FEDA	Mr. Abhir Naik External Expert (Industry)	Mr. Lokesh Mehra External Expert (Industry)	Mr. Yogesh Bhalla (Special Invitee)

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Department of Computer Science and Engineering

Faculty of Engineering Design and Automation

Ref No.GU/FEDA/ET/2021-22/149-B **Date: June-10-2022**

ACTION TAKEN REPORT

The Board of Studies (BoS) of the department of Computer Science and Engineering/FEDA-E was held on June 8, 2022. After deliberate discussion, the members suggested some changes in Program Ordinances and Syllabi of B. Tech (CSE) & M. Tech (CSE). The suggestions given by the panel of BOS have been discussed with the Vice Chancellor and the actions taken on the suggestion have been approved by him.

Sr.No.	Points of discussion	Suggestions of the BOS	Actions Taken
1.	Program Ordinances • B.Tech. (CSE) • M.Tech (CSE)	• In B. Tech (CSE), B. Tech (CSE) the subject Computer Networks, code: BCS501 in Semester V should be swapped with Subject: Open Elective-I in Semester III.	The mentioned subject is replaced with Subject: Computer Networks, code: BCS501 **(Suggestions Implemented)**
		• In of M. Tech (CSE) the subject Disaster Management code: MCS0002 should be removed from Semester II and the subject Advance Java Programming, code: MCS1152 and Advance Java Programming Laboratory, code: MCS1153 should be introduced in Semester II.	The mentioned subject and their labs are added. **(Suggestions Implemented)**

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			The suggestions implemented, labs of most of the elective subjects introduced.
2.	Syllabi of various programs	• In B. Tech (CSE), B. Tech (CSE) code: DEVOPS Laboratory, code: BTCC711 should be added in Semester VII.	Syllabus Revised. **(Suggestions Implemented)**
		• In B. Tech (CSE), Syllabus of subject React/Node JS Technology, code: BTFS501, Introduction to GRPC should be added in Semester III.	The GRPC topic added to the respective subject. **(Suggestions Implemented)**
		• In B. Tech (CSE), B. Tech (CSE) In Subject, Basic of python, BCS209 should be revised in Semester III.	• Revised Syllabus Basic of python, BCS209 in Semester III. **(Suggestions Implemented)**
		• In M.Tech (CSE), syllabus of subject Advance Java Programming, code: MCS1152 along with Laboratory, code: MCS1153 should be added. • In M.Tech (CSE), syllabus of subject Blockchain Technologies should be added as elective subject.	The Syllabi of both the subjects added. **(Suggestions Implemented)**

		• In M.Tech (CSE) the subject Blockchain Technologies, code: MCS1143 should be introduced as elective subject. • In M. Tech (CSE) Laboratory of Elective-IV should be introduced in Semester III.	The mentioned subject and their labs are added in the respective semester. **(Suggestions Implemented)**
		• In M.Tech (CSE) Laboratory contact hours should be reduced to 2 from 4 to accommodate the credits of new introduced laboratory subjects.	The mentioned subject has been removed and the other subject with lab has been added. **(Suggestions Implemented)**
		• In M.Tech (CSE) Labs of elective subjects should be introduced.	The lab has been introduced in Sem-III. **(Suggestions Implemented)**
		• For all other ordinances, there is no change recommended by the committee.	The mentioned subject has been added as it is one of the emerging area. **(Suggestions Implemented)** The suggestions implemented.

3.	Examination Pattern	Nil	Nil
4.	Pedagogy	Nil	Nil
5.	Any other Suggestion(s)	Nil	Nil

Chairperson

Vice Chancellor

GNA University

CURRICULUM AND SYLLABUS

FOR

B.Tech. in COMPUTER SCIENCE AND ENGINEERING

ACADEMIC YEAR

2022-23 onwards

DEPARTMENT OF COMPUTER SCIENCE AND

ENGINEERING

FACULTY OF ENGINEERING, DESIGN ANDAUTOMATION

GNA UNIVERSITY

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

ORDINANCE

FOR

BACHELOR OF TECHNOLOGY (COMPUTER SCIENCE & ENGINEERING)

(THIS ORDINANCE HAS BEEN APPROVED IN THE MEETING OF BOARD OF STUDIES HELD ON DATED: 8-June-2022)

APPLICABLE W.E.F. ACADEMIC SESSION 2022-2023

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION

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

ORDINANCE FOR
B. TECH COMPUTER SCIENCE AND ENGINEERING

SHORT TITLE AND COMMENCEMENT

I. This ordinance shall be called the ordinance for the B. Tech Computer Science and Engineering, School Of Engineering Design And Automation at GNA University, Phagwara.

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

1. Vision of the department: To produce competent technocrats, researchers and entrepreneurs in the area of Computer Science and Engineering with technical skills and ethical values to be accepted globally, meeting societal expectations and to generate employability.

2. Mission of the department:

- **M1:** To establish an environment that is conducive for learning and inculcation of professional ethics.
- **M2:** To provide real time exposure to latest hardware and software technologies in Computer Science for meeting the growing needs of industry.
- **M3:** To impart ethical, technical and holistic skills through a well-designed curriculum.
- **M4:** To promote entrepreneurship and R & D activities by encouraging the students to participate in national/international events.
- **M5:** To enhance industry-institute interaction for mutual benefits.

3. Name of Faculty: Faculty of Engineering Design and Automation (FEDA).

4. Name of Program: B.Tech. Computer Science and Engineering

5. Program Educational Objectives

The program educational objectives of B. Tech program of Computer Science & Engineering at GNA University are:

- **PEO1** Graduates will be able to apply their technical skills in the design and implementation of systems, particularly in software and hardware components.
- **PEO2** Graduates will be able to adapt, contribute, and innovate in the key domains of Computer Science and Engineering and relevant branches of engineering.
- **PEO3** Graduates will be able to obtain employment in organizations or be entrepreneurs by establishing themselves as professionals and applying professional ethics and technical skills to solve real-life problems and meet the diversified needs of the industry, academia, and research sectors.

6. Program Outcomes:

The following are the program outcomes of the course:

- **PO1: Engineering Knowledge:** Apply the knowledge of Mathematics, Science, Engineering Fundamentals, and an Engineering specialization to the solution of complex engineering problems.
- **PO2: Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

- **PO3: Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to providevalid conclusions.
- **PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineeringand IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **PO6: The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO7: Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
- **PO9: Individual and Teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12: Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

7. Program Specific Outcome: By the completion of B. Tech CSE program the student will have thefollowing Program specific outcomes.

- **PSO1:** Ability to apply mathematical concepts to solve computational and real-world problems.
- **PSO2:** Ability to use domain knowledge of Computer Science to facilitate decision making analysis and problem solving.
- **PSO3:** Ability to design system solutions by operationalizing hardware and software components.
- **PSO4:** Utilize entrepreneurial ecosystem to identify research gaps and initiate new ventures.

8. General Regulations for Faculty of Engineering, Design and Automation:

8.1 The University may introduce programs under the Faculty of Engineering, Design and Automation which are specified under the UGC Act 1956. The Governing Body may approve the introduction, suspending or phasing out a program on their commendation of the Academic Council either on its own or on the initiative of faculty.

8.2 The admissions to a Faculty of Engineering, Design and Automation programs shall be generally governed by

the rules of the UGC/AICTE or another competent authority of the MHRD or as approved by Governing Body of University and shall be as notified in the admission notification of the respectiveacademic year.

8.3 The minimum entry qualification for admission to the students of Faculty of Engineering, Design and Automation 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 Engineering, Design and Automation shall be the Senior Secondary School Certificate (10+2) examination in non-medical, while deciding the admission procedure, the University may lay down compulsory subjects in qualifying examination for admission for various programs in the admission policy.

8.4 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.

8.5 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.

8.6 A student may be granted such scholarship as may be specified in accordance with the directions of theGoverning Body from time to time or regulations laid down for the same.

8.7 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.

8.8 The students shall abide by the regulations mentioned in the 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.

8.9 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 opinionis necessary or expedient for the smooth running of the program: provided all such changes are reportedapproved to the Council in its next meeting.

9. General Regulations for the B.Tech. Computer Science and Engineering

Short Title and Commencement: These regulations shall be called regulations for the UG programin Faculty of Engineering, Design and Automation of the University and shall come into force on such dates as the Academic Council may approve

9.1 Duration: The duration of the UG program leading to degree of Bachelor of Technology shall be minimum four years and each year will comprise of two semesters. However, the duration may be extended up to six years 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 rustication orany 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.

9.2 Starting or phasing out of Program: The University may offer such Undergraduate programs in Engineering leading to award the degree of Bachelor of Technology, as per no men cloture lay by the UGC/AICTE 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 Councilmay approve starting a new program or modifying the existing one on the recommendations of the Academic Council.

9.3 Admissions: Admission in Engineering programs 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, and/or direct entry into year II through lateral entry scheme etc. shallbe defined in the admission policy.

9.4 Eligibility for Admission: 10+2 (Non-Medical) with 55% equivalent with (45 % for SC/ST/OBC) marks in aggregate from any recognized board.

9.5 The Lateral Entry into this program enables candidates with a 3-year diploma in Engineering (any stream) or an equivalent degree to get admitted directly to 2nd Year (3rd semester).

9.6 Semester System: The Engineering academic programs in the University shall be based on Semester System; namely, even (Jan to June) and Odd (July to Dec) Semesters, in an academicyear. The courses offered in the regular semester shall be evaluated as per the policy and procedure laid down.

9.7 Semester Duration: Total duration of the Program shall be four years and each year will comprise of two semesters. In addition, each semester shall normally have 90 working days.

10. Curriculum: The four years curriculum has been divided into eight semesters and shall include lectures/ tutorials/ Lab work/ field work/ outreach activity/ project work/ viva/ seminars/ presentations/ term papers/ assignments etc. or a combination of some of these. 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 the Choice Based Credit System (CBCS), whichprovides 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. Following are the types of courses and structure for the program:

Course Categories:

I.	BSC:	Basic Science Courses
II.	ESC:	Engineering Science Courses
III.	HSMC:	Humanities and Social Sciences including Management Courses
IV.	PCC:	Professional core courses
V.	PEC:	Professional Elective courses
VI.	OEC:	Open Elective courses
VII.	MC:	Mandatory courses (Audit Course)
VIII.	PROJ:	Project

Basic Science Courses: A Basic Science Course includes Mathematics, Physics, Chemistry and English to all the 1st year engineering streams.

Engineering Science Courses: These are the courses which are extensions of basic science courses to be used in the Engineering.

Professional Core Course: A course, which should compulsorily be studied by a candidate as a core requirement to complete the requirement of program in as a discipline of study.

Professional Elective Course: Generally, a course which can be chosen from a pool of courses, and whichmay 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/ skills called an Elective Course.

Open Elective Course (OEC): An elective course chosen generally from an unrelated discipline/subject, with an intention to add generic proficiency to the students.

Note: **A core course ordered 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 Generic Elective. Elective Course(s) may also be called an "Open Elective.**

Mandatory Course (MC) or Audit Course (AC)

The introduction of two Audit courses covering subjects of developing desired attitude among the learners ison the line of initiatives such as Unnat Bharat Abhiyan, Yoga, Value education, Disaster management, Sanskrit, Pedagogy, Constitution of India, Personality development through Indian culture, EnvironmentalScience etc.

Minor/Major Project:

The objective of Minor/Major Project is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individualbasis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Development/Analysis/ Modeling/ Simulation/ Experiment/ Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.

The objective of Major Project is to enable the student to extend further the investigative study taken up under Minor Project, either fully theoretical/practical or involving both theoretical andpractical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry.

12. Medium of Instructions:

12.1 The medium of instructions and examination will be English.

12.2 Practical work/Project Work / Project Report / Dissertation / Field Work Report / Training Reportetc., if any, should be presented in English.

13. Mode:

The program is offered in 'Full Time' mode of study only.

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

14.1 Every student is required to attend at least 75% of the lectures delivered squaring tutorials, practicaland other prescribed curricular and co-curricular activities.

14.2 The Dean of Faculty may give a further relaxation of attendance of up to 10% to a student if he/she hasbeen absent with prior permission of the Dean of the Faculty for the reasons acceptable to him/her.

14.3 Further, relaxation up to 5% may be given by the Vice Chancellor to make a student eligible under special circumstances only.

14.4 No student will be allowed to appear in the end semester examination if he/she does not satisfy the attendance requirements. Further, attendance shall be counted from the date of admission in the University or commencement of academic session whichever is later.

14.5 Attendance of N.C.C/N.S.S. Camps or Inter-Collegiate or Inter-University or Inter-State or Internationalmatches or debates or Educational Excursion or such other Inter-University activities as approved by theauthorities' involving journeys outside the city in which the college is situated will not be counted as an absence. However, such absence shall not exceed four weeks per semester of the total period of instructions. Such a type of facility should not be availed twice during the study

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

A letter grade, corresponding to a specified number of grade points, is awarded in each course for whicha student is registered. On obtaining a passing grade, the student accumulates the course credits as earnedcredits. 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.

15.1 Earned Credits (EC): The credits assigned to a course in which a student has obtained 'D' (a minimum passing grade) or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained an 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 requiredper week.

Definition of Credit	
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. 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 should be done from SWAYAM or other approved 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.

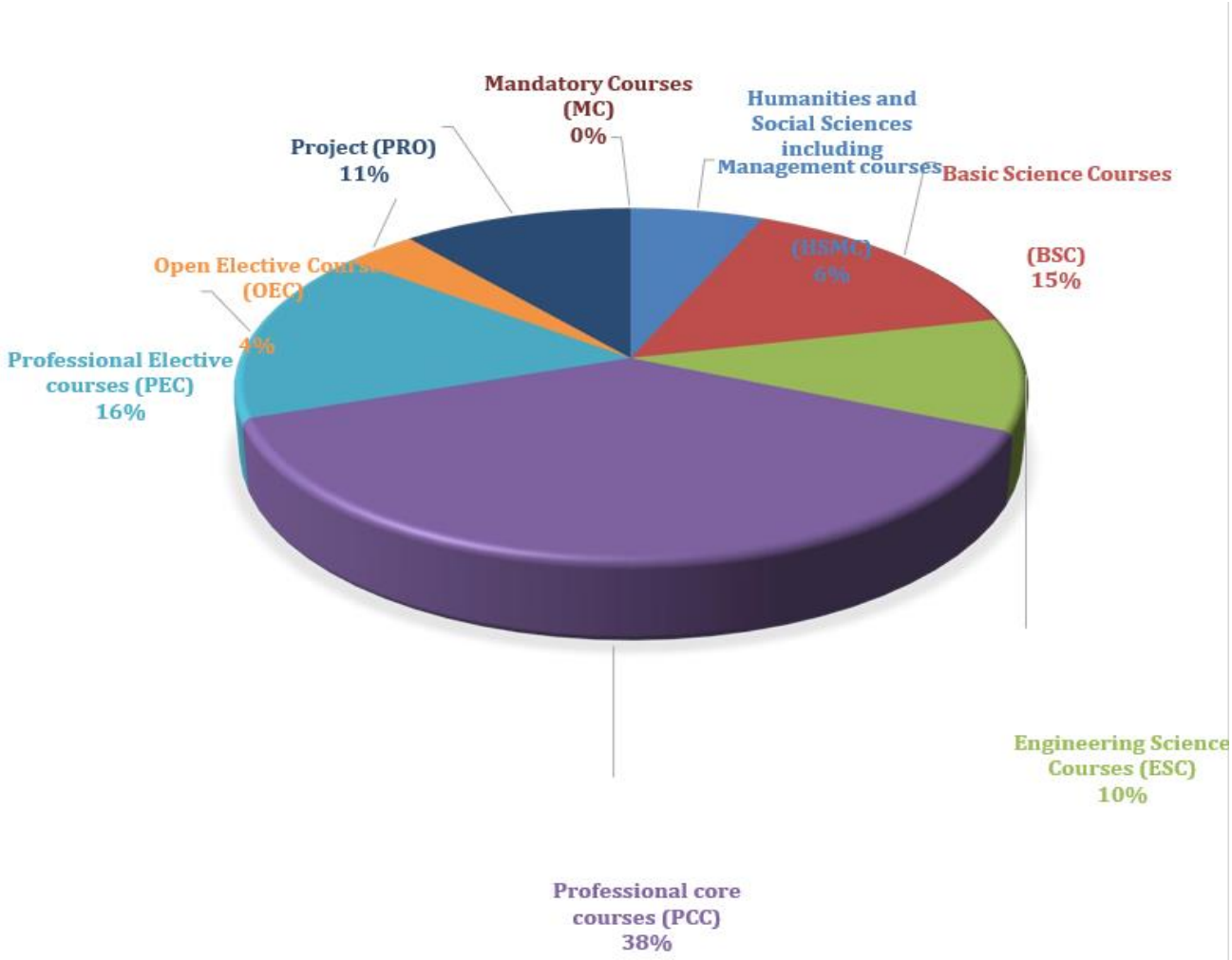
i) MOOC coordinators shall be appointed for each of the course taken by the student.

17. Program Structure: As per GNA University

Semester wise Credit point distribution

Sr.No.	Year	Credits	
		Odd	Even
1	First	21	23
2	Second	26	24
3	Third	23	23
4	Fourth	22	12
Total Credit Points		**92**	**82**

Course Category wise credits points distribution (in percentage)



Academic Year 2022-2023		
Course Component	Total number of credits Curriculum Content (% of total number of credits of the program)	Total number of credits
Basic Science Courses (BSC)	14.94	26
Engineering Science Courses (ESC)	10.34	18
Humanities and Social Sciences including Management courses (HSMC)	6.32	11
Professional Core Course (PCC)	37.93	66
Professional Elective Course (PEC)	16.09	28
Open Elective Course (OEC)	3.45	6

Project (PROJ)	10.92	19
Mandatory Courses (MC)	-	Non-Credit
	100.00	**174**

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 and year 3, preferably in an industry, R & D institutions or in an academic institution is of repute permitted. Training after 4th & 6th semester shall be graded and is essential part of the degree.
- A student should undergo industrial training for six months, starting after 7th semester, preferably in an IT industry, R & D institutions is of repute permitted. Training shall be graded after producing a certificate and is essential part of the degree
- It is the responsibility of the Corporate Relations Department (CRD) to arrange 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 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 Engineering, Design and Automation for approval.

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:

19.1 Internal Assessment: It includes components such as Attendance, Mid-Semester Examination, Assignments, and MOOC/LinkedIn/Test, Presentation/Quiz carrying a weightage of 40%. This is applicable to all theory courses.

19.2 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.

19.3 Laboratory Internal Assessment: It includes components Lab Assessment/Practical File, Internal viva, Attendance carrying a weightage of 60%. The internal marks of special courses like Project, summer industry training, and six-month industry training has been predefined.

19.4 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.

19.5 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.

19.6 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.

19.7 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.

19.8 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.

19.9 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.

20.1 Eligibility: Student with 'F' grade is eligible to appear in the Supplementary Examination.

20.2 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. 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.

22. 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.

22.1 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	-

22.2 Description of Grades:

22.3 **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.

22.4 **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.

22.5 **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.

22.6 **'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.

22.7 **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.

22.8 **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 decimals 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.

23. Program qualifying criteria: For qualifying the Program every student is required to earn prescribed credits **(i.e. 171).** 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 durationof degree.

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

25. Conditions for Award of a Degree:

a) Nomenclature of the degree is mentioned in B. Tech CSE Program Structure Model.

b) 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.

c) Should complete the requirements of the Degree in maximum duration specified for the program. Semester withdrawals due to medical reasons are not counted in eight years in degree. However, forced withdrawal of

students e.g., suspension or expulsion or non-attendance by student due to any other reasons, shall count in the maximum period of eight years for degree and minimum period of two years for five years for degree.

d) Successfully completing the Internship/Training.

e) 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.

Semester Wise Structure and Curriculum for B. Tech Computer Science & Engineering

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester I (First year)

Sr.No	Category	Course Code	Course Title	Hours per week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	BSC	BTP102	SemiconductorPhysics	3	1	0	40	60	100	4
2	BSC	BTM102	Mathematics-I	3	1	0	40	60	100	4
3	ESC	BEE101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
4	HSMC	COM101	English Communication	2	0	0	40	60	100	2
5	BSC	BTP122	Semiconductor Physics Laboratory	0	0	2	30	20	50	1
6	ESC	BEE121	Basic Electrical & Electronics Engineering Laboratory	0	0	2	30	20	50	1
7	PCC	BCS101	Programming forProblem Solving	3	0	0	40	60	100	3
8	HSMC	COM121	English Communication Lab	0	0	2	30	20	50	1
9	PCC	BCS121	Programming forProblem SolvingLaboratory	0	0	2	30	20	50	1
10	MC	ENS001	Environmental Science	2	-	-	40	0	40	S/US (Non-Credit)
	Total			16	3	8	360	380	740	21

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester II (First year)

Sr. No	Category	CourseCode	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	BSC	BTC101	Engineering Chemistry	3	1	0	40	60	100	4
2	BSC	BTM202	Mathematics-II	3	1	0	40	60	100	4
3	PCC	BCS302	Object Oriented Programming Language using C++	3	0	0	40	60	100	3
4	ESC	BME102	Engineering Drawing and Graphics	1	0	4	40	60	100	3
5	HS MC	COM201	Business Communication	2	0	0	40	60	100	2
6	BSC	BTC121	Chemistry Laboratory	0	0	2	30	20	50	1
7	ESC	BME123	Workshop /ManufacturingPractices	0	0	4	60	40	100	2
8	HS MC	COM221	Business Communication Laboratory	0	0	2	30	20	50	1
9	PCC	BCS322	Object Oriented Programming Language using C++ Laboratory	0	0	2	30	20	50	1
10	HS MC	UHV001	Universal HumanValues	2	0	0	40	60	100	2
	Total			14	2	14	390	460	850	23

Note: Student will take 4 weeks in-house summer training after 2nd semester. The assessment for this will be included in the3rd Semester.

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester III (Second year)

Sr. No	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	PCC	BCS301	Data structure &Algorithms	3	0	0	40	60	100	3
2	PCC	BCS209	Basics of Python	3	0	0	40	60	100	3
3	ESC	BEE302	Digital Circuitand Logic Design	3	0	0	40	60	100	3
4	BSC	BTM302	Mathematics-III	3	1	0	40	60	100	4
5	HSMC	DOS001	Ancient Greek and Medieval Philosophy	3	0	0	40	60	100	3
6	PCC	BCS321	Data Structure & Algorithms Laboratory	0	0	2	30	20	50	1
7	PCC	BCS222	Basics of Python Laboratory	0	0	2	30	20	50	1
8	PROJ	BCS300	Summer Internship	-	-	-	40	-	40	S/US
9	PEC	B***	Elective–I	3	0	0	40	60	100	3
10	ESC	BEE322	Digital Circuit andLogic Design Laboratory	0	0	2	30	20	50	1
11	PCC	BCS501	Computer Networks	3	0	0	40	60	100	3
12	PCC	BCS521	Computer Networks Laboratory	0	0	2	30	20	50	1
	Total			**21**	**1**	**8**	**440**	**500**	**940**	**26**

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester IV (Second year)

Sr. No	Category	CourseCode	Course Title	Hoursper Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	PCC	BCS401	Operating Systems	3	0	0	40	60	100	3
2	PEC	B***	Elective–II	3	0	0	40	60	100	3
3	ESC	BCS303	Computer Organization & Architecture	3	0	0	40	60	100	3
4	BSC	BTM402	Discrete Mathematics	3	1	0	40	60	100	4
5	PCC	BCS402	Java Programming	3	0	0	40	60	100	3
6	PCC	BCS502	Database Management Systems	3	0	0	40	60	100	3
7	PCC	BCS421	Operating Systems Laboratory	0	0	2	30	20	50	1
8	PCC	BCS522	Database Management Systems Laboratory	0	0	2	30	20	50	1
9	PEC	B***	Elective–II Laboratory	0	0	2	30	20	50	1
10	PCC	BCS422	Java Programming Laboratory	0	0	2	30	20	50	1
11	ESC	BCS333	Computer Organization & Architecture Laboratory	0	0	2	30	20	50	1
	Total			**18**	**1**	**10**	**390**	**460**	**850**	**24**

**** Students will take 4-6 weeks summer training in Industry after 4thsemester.***

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester V (Third year)

Sr No.	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	PCC	BCS602	Software Engineering	3	0	0	40	60	100	3
2	PCC	BCS503	Formal Language & Automata Theory	3	0	0	40	60	100	3
3	PCC	BCS504	Web Technologies	3	0	0	40	60	100	3
4	PCC	BCS604	Computer Graphics	3	0	0	40	60	100	3
5	PEC	B***	Elective–III	3	0	0	40	60	100	3
6	OEC	******	Open Elective–I	3	0	0	40	60	100	3
8	PCC	BCS525	Web Technologies Laboratory	0	0	2	40	60	100	1
9	PROJ	BCS500	Summer Internship*	-	-	-	50	50	100	2
10	PEC	B***	Elective –IIILaboratory	0	0	2	40	60	100	1
11	PCC	BCS624	Computer Graphics Laboratory	0	0	2	30	20	50	1
12	PCC	PDP102	Placement Preparation–I	0	0	2	-	-	-	S/US
	Total			**18**	**0**	**10**	**430**	**570**	**1000**	**23**

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester VI (Third year)

Sr. No	Category	Course Code	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	PCC	BCS651	Advance Java Programming	3	0	0	40	60	100	3
2	PCC	BCS601	Compiler Design	3	0	0	40	60	100	3
3	PCC	BCS603	Design and Analysis of Algorithms	3	0	0	40	60	100	3
4	PEC	B***	Elective–IV	3	0	0	40	60	100	3
5	PEC	B***	Elective–V	3	0	0	40	60	100	3
6	PEC	B***	Elective–VI	3	0	0	40	60	100	3
7	PROJ	BCS722	Minor Project	0	0	2	40	60	100	1
8	PCC	BCS621	Complier Design Laboratory	0	0	2	30	20	50	1
9	PCC	BCS623	Design and Analysis of Algorithms Laboratory	0	0	2	30	20	50	1
10	PCC	BCS652	Advance Java Programming Laboratory	0	0	2	30	20	50	1
11	PEC	B***	Elective-V Laboratory	0	0	2	30	20	50	1
12	PCC	PDP103	Placement Preparation-II	0	0	2	-	-	-	S/US
				18	**0**	**12**	**400**	**500**	**900**	**23**

**** Students will take 4-6 weeks summer training in Industry after 6thsemester and evaluation will be done in 7th semester.***

FACULTY OF ENGINEERING, DESIGN AND AUTOMATION
B. TECH COMPUTER SCIENCE AND ENGINEERING

2022-2023

Semester VII (Fourth year)

Sr. No	Category	CourseCode	Course Title	Hours per week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	PCC	BCS701	Artificial Intelligence	3	0	0	40	60	100	3
2	PCC	BCS942	Computer Vision	3	0	0	40	60	100	3
3	PEC	B***	Elective-VII	3	0	0	40	60	100	3
4	PEC	B***	Elective-VIII	3	0	0	40	60	100	3
6	OEC	B***	Open Elective– II	3	0	0	40	60	100	3
7	PROJ	BCS822	Major Project	0	0	4	50	50	100	2
8	PROJ	BCS700	Summer Internship*	-	-	-	50	50	100	2
9	PCC	BCS712	Artificial IntelligenceLaboratory	0	0	2	30	20	50	1
10	PCC	BCS932	Computer Vision Laboratory	0	0	2	30	20	50	1
11	PEC	BTCC711	DEVOPS Laboratory	0	0	2	30	20	50	1
	Total			**15**	**0**	**10**	**430**	**520**	**950**	**22**

Semester VIII (Fourth year)

Sr. No	Category	CourseCode	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
				L	T	P	Internal	External		
1	PROJ	BCS800	Industrial Training and Project	0	0	0	500	500	1000	12
	Total			**0**	**0**	**0**	**500**	**500**	**1000**	**12**

LIST OF ELECTIVES:

Sr. No.	Elective	Semester	Course Code	Course Title
1.	Elective-I	3	BTFS301	Basics of Front-End Development
		3	BTCC101	Introduction to Cloud Computing
		3	BTCY301	Fundaments of Cyber Security and Network Security
		3	BTBD101	Introduction to Artificial Intelligence
2.	Elective-II	4	BTFS401	Back-End Development using PHP and MySQL
		4	BCS542	Linux and Shell Programming
		4	BTBD401	Machine Learning and Applications
3.	Elective-III	5	BTFS501	React/Node JS Technology
		5	BTCC507	Cloud Computing Tools
		5	BTCY501	Cryptography
		5	BTBD501	Data Visualization
4.	Elective-IV	6	BTFS602	Front End Framework using Angular
		6	BTCC604	Cloud Security
		6	BTCC603	Information Security
		6	BTBD603	Natural Language Processing
5.	Elective-V	6	BTFS601	Mobile Application Development
		6	BCS543	Dot Net Technologies
		6	BCS645	Ethical Hacking
		6	BTBD601	R Programming
6.	Elective-VI	6	BTFS604	Python Web Development
		6	BTCC604	Cloud Security
		6	BTCY605	Malware Analysis
		6	BTDA603	Time Series Analysis and Forecasting
7.	Elective-VII	7	BTFS703	UI and UX Design

		7	BTCC701	Cloud Database Management
		7	BCS742	Cyber Crime Investigation and Digital Forensic
		7	BTDA702	Data Warehouse and Mining
8.	Elective-VIII	8	BTFS701	Microservices and Design Patterns
		8	BTCC702	Deployment of Microservices
		8	BCS747	Intrusion Detection System
		8	BTDA701	Data Engineering

List of Electives Laboratory

Sr. No.	Elective	Semester	Course Code	Course Title
2.	Elective-II	4	BTFS421	Back-End Development using PHP and MySQL Laboratory
		4	BCS524	Linux and Shell Programming Laboratory
		4	BTBD421	Machine Learning and Applications Laboratory
3.	Elective-III	5	BTFS511	React/Node JS Technology Laboratory
		5	BTCC527	Cloud Computing Tools Laboratory
		5	BTCY511	Cryptography Laboratory
		5	BTBD521	Data Visualization Laboratory
5.	Elective-V	6	BTFS621	Mobile Application Development Laboratory
		6	BCS527	Dot Net Technologies Laboratory
		6	BCS655	Ethical Hacking Laboratory
		6	BTBD621	R Programming Laboratory

LIST OF OPEN ELECTIVES

OPEN ELECTIVE I & II

Sr. No	Course Code	Course Name	L	T	P	Cr
1	BEE036	Internet of Things	3	0	0	3
2	VAE031	Values and Ethics	3	0	0	3
3	FME031	Fundamentals of Management for Engineers	3	0	0	3
4	BSOP401	MATLAB for Engineers	3	0	0	3
5	BSOP402	Content Management System	3	0	0	3
6	BSOP403	Digital Marketing	3	0	0	3
7	BSOP404	Statistics for Engineers	3	0	0	3

SYLLABUS

FOR

BEACHLOR OF TECHNOLOGY (COMPUTER SCIENCE & ENGINEERING)

(THIS ORDINANCE HAS BEEN APPROVED IN THE MEETING OF BOARD OF STUDIES HELD ON DATED: 08 June 2022)

APPLICABLE W.E.F. ACADEMIC SESSION 2022-2023

FACULTY OF ENGINEERING, DESIGN ANDAUTOMATION

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

FIRST SEMESTER

BTP102: SEMICONDUCTOR PHYSICS
Credits: 4
LTP: 3 1 0

Course Objectives:
The aim and objective of the course is to expose the students to the basics of SemiconductorPhysics and Lasers so that they can use these in Engineering as per their requirement.

Course Outcomes (CO):
The concepts developed in this course will aid in quantification of several concepts in Physics.Technology is being increasingly based on semiconductors.

The course will enable the student to:

CO1: Explain the fundamental principles and properties of electronic materials and semiconductors.

CO2: Analyze the design, fabrication, and characterization techniques of Engineered semiconductormaterials.

CO3: Interpret the importance of Lasers and wave equations in nature and appreciate the mathematicalformulation of the same.

CO4: Develop the basic tools with which they can study and test the newly developed devices andother semiconductor applications.

Course Contents:

UNIT I

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states,Occupation probability, Fermi level, Effective mass, Phonons

UNIT II

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carriertransport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT III

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulatedemission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT IV

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of lightby population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity.

Recommended Books/ Suggested Readings:

J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995)

1. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
2. S. M. Sze: Semiconductor Devices: Physics and Technology, Wiley (2008).
3. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, OxfordUniversity Press, New York (2007).
4. P. Bhattacharya: Semiconductor Optoelectronic Devices, Prentice Hall of India (1997)

BTP122: SEMICONDUCTOR PHYSICS LABORATORY
Credits: 1
LTP: 3 1 0

Pre-Requisites: NA

Course Description:

It draws the connection between theoretical knowledge and its application in the context of analyzingvarious electronic circuits and their components.

Course Outcomes (CO):

CO1: The student will learn to draw the relevance between theoretical knowledge and the means toimply it in a practical manner by performing various relative experiments.

CO2: The student will be enabled to know about the characteristics and the behavior of various materials in a practical manner and gain knowledge about various communication mediums and its usage

Choice of 10-12 experiments from the following:

List of Experiments:

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To find the quality factor of a damped harmonic oscillator.
3. To study one dimensional collision using two hanging spheres of different materials.
4. To determine the Moment of Inertia of a Flywheel.
5. To find out the frequency of AC mains using electric–vibrator.
6. To determine g by Bar Pendulum.
7. To determine g by Kater's Pendulum
8. To study the magnetic field of a circular coil carrying current.
9. To study B–H curve using CRO.
10. To find out dielectric constant of a dielectric substance.
11. To study the laser beam characteristics like; wave length using diffraction grating aperture
12. To determine numerical aperture of an optical fiber.
13. To determine attenuation & propagation losses in optical fibers.
14. To find the refractive index of a material using spectrometer.
15. To determine the grain size of a material using optical microscope.

Physics virtual lab:

1. To study Zener diode voltage as regulator and measure its line and load regulation.
2. To study the B-H Curve.
3. To draw the static current-voltage (I-V) characteristics of a junction diode
4. To determine the resistivity of semiconductors by Four Probe Method.
5. Verification and design of combinational logic using AND, OR, NOT, NAND and XORgates.
6. To determine the magnetic susceptibilities of paramagnetic liquids by Quincke's Method.

BTM102: MATHEMATICS-I
Credits: 4
LTP: 3 1 0

Pre-Requisites: NA

Course Description: The course aims to equip the students with the ability to familiarize the prospective engineers with techniques in basic calculus and linear algebra and equip them withstandard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes (CO):

The course will enable the student to:

CO1: Apply fallouts of Rolle's Theorem that is fundamental to application of analysis toEngineering problems.

CO2: Solve problems related to matrices and linear algebra including linear transformations,eigen values, diagonalization.

CO3: Characterize a set of vectors and linear systems using the concept of linear independence.

CO4: Identify and construct linear transformations of a matrix

CO5: To solve first order differential equations utilizing the standard techniques for separable,exact, linear, homogeneous, or Bernoulli cases.

Course Contents:

UNIT I

Calculus: Evolute and Involute; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle 's Theorem, Mean value theorems, Taylor's and Maclaurintheorems with remainders; Indeterminate forms and Hospital's rule; Maxima and minima.

UNIT II

Matrices: Solution of linear systems of equations, linear Independence, rank of a matrix, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination; Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigen bases. Diagonalization.

UNIT III

Vector spaces: Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a lineartransformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

UNIT IV

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler'sequations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher orders: Second order linear differentialequations with variable coefficients, method of variation of parameters.

Recommended Books/ Suggested Readings:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.
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. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.

BEE101: BASIC ELECTRICAL & ELECTRONICS ENGINEERING
Credits: 4
LTP: 3 1 0

Course Description:

The course aims to equip the students with the basic concepts of electricity, electrical components and their applications. Also explain the working principle, construction, applications of various electrical machines. The course includes the basic fundamentals of electronic components, devices and transducers, principles of digital electronics and concepts of basic electricity and electrical circuits which includesSCR, Transformer, magnetic circuits etc.

Course Outcomes (CO):

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

CO1: Deal with the applications of Electrical Engineering and Electronics Engineering. This knowledge gives them a brief outline of the fundamentals that would be the foundations of today's and tomorrow's technology.
CO2: Understand new trends in Electronics and Electrical Engineering.
CO3: Impart detail knowledge of basic electronics, digital electronic concepts etc.
CO4: Get practical knowledge of electronics instruments, components and their specifications, uses etc.
CO5: Analyze and solve electric and magnetic circuits, Identify functions of digital multimeter, cathode ray oscilloscope and various devices in the measurement of physical variables.

Course Content

UNIT I

Fundamentals of dc circuits: Introduction of CRO and multimeter, fundamentals of electricity (current, voltage, inductor, capacitor, resistor), ohm's law, Kirchhoff's' current and voltage law, series and parallel resistances and their circuit analysis. Elementary calculations for energy consumption and power factor improvement.

UNIT II

Fundamentals of ac circuits: AC circuits (generation, AC values, waveforms), Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. AC circuits (resistive, capacitive, inductive circuits)**,** Impedance, admittance, polar form and rectangular form in AC circuits.

UNIT III

Principles of Magnetic circuits and transformers: Magnetism and transformers (Electromagnetic Induction, Mutual Induction), Working of Transformers (operation, principle turns ratio and applications), Losses in transformers, Rating and emf equation of transformers. Laws and terminologies in magnetic circuits.

UNIT IV

Electrical Installations & Power Converters: Components of LT Switchgear: Fuse, MCB, ELCB, MCCB, Types of Wires and Cables, Earthing and grounding. Batteries & UPS and its types. Introduction to SCR, DIAC, TRIAC and its VI characteristics.

UNIT V

Basics of Electronics: Introduction to Semi-Conductor materials (PN junction diodes, biasing and construction of PN Diode, Zener diode and its applications), Bipolar Junction Transistors (Construction, Working, configurations of Transistor and Applications).

UNIT VI

Digital Electronics: Introduction, number system and conversion, basic logic gates and their truth tables, Flip-Flop's, Half and full adder, Half and full subtractor, Multiplexer and De multiplexer encoder, Decoder.

Recommended Books/ Suggested Readings:

1. B. L Thareja, Fundamentals of Electrical Engineering and Electronics, S. CHAND 1st2013.
2. Earl Gates, Introduction to Electronics, DELMAR CENGAGE LEARNING, 6th Edition2013.
3. J.B Gupta, Basic electrical and electronics engineering, S.K Kataria and sons edition2013.
4. Basic Electrical and Electronics and Computer Engineering by R Muthu Subramanian, SSalivahanan, K A

Muraleedharan, Tata McGraw Hill.
5. Basic electrical and electronics engineering DP KOTHARI 4TH EDITION 2013 MC GrawHill.

GNA UNIVERSITY
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BEE121: BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY
Credits: 1
LTP: 3 1 2

Pre-Requisites: NA

Course Description: In this lab, the students of all engineering streams are trained in basic concepts of electronics and electrical engineering, such as AC to DC conversion, measurement, transformer, verification of basic laws and theorems, use of CRO, DSO, etc.

Course Outcomes (CO):
After completion of this course students will be enable to –
CO1: Handle basic electrical equipment.
CO2: Do staircase wiring.
CO3: Understand domestic wiring procedures practically.
CO4: Assemble electronic systems.
CO5: Understand all the fundamental concepts involving electrical engineering.

List of Experiments

1. To verify ohm's law and its limitations
2. To calculate the resistances and verify ohm's law for the wires of different material
3. To calculate the resistances of colored resistors
4. To verify Kirchhoff's current and voltage law
5. To study the various functions of CRO and calculate the amplitude and frequency of a sinewave using CRO.
6. To measure power and power factor in a single-phase ac circuit.
7. To find out voltage – current relationship in a R-L-C series and parallel circuit anddetermine the resonance frequency of the circuit
8. To measure the resistance and inductance of a coil by ammeter- voltmeter method.
9. To obtain the characteristics of a pn junction diode.
10. To verify the application of zener diode as a voltage regulator
11. To verify the input and output characteristics of CE, CB and CC npn transistor.
12. To verify the functioning of a transistor as an amplifier
13. To verify the truth table of the various logic gates
14. To study the BCD to decimal encoder kit.

COM101: ENGLISH COMMUNICATION
Credits: 2
LTP: 0 0 2

Pre-Requisites: NA

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:

After completion of this course, students will enable to -

CO1: To employ pre-reading, skimming, and prewriting techniques

CO2: To demonstrate a significant increase in word knowledge

CO3: To heighten awareness of correct usage of English grammar in writing and speaking.

CO4: To plan, draft, revise and edit writing passages

UNIT I

Reading Skills: Comprehension Strategies- Skimming, Scanning Inferencing, Summarizing of Newspaper Articles, Paraphrasing of Complex Sentences.

UNIT II

English Grammar and Usage: Parts of Speech, Common Errors in writing, Tenses, Change of Voice, Transformation of Sentences.

UNIT III

Basic Writing Practices: Paragraph writing, Picture Composition, University based Notices, Notes Making after listening to a Motivational Speech, Formal Letter based on university concerns, MS Word (font style, size, format, spacing)

UNIT IV

Vocabulary Enrichment: Word Coinage, Synonym, Antonym, Homophones, 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

COM121: ENGLISH COMMUNICATION LABORATORY
Credits: 1
LTP: 2 0 0

Pre-Requisites: NA

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):

After completion of this course students will be enable to -

CO1: Better understanding of nuances of English language through audio-visual experience and group activities.

CO2: Speaking skills with clarity and confidence enhancing their employability skills.

CO3: Better comprehension of speech of people of different backgrounds and regions.

CO4: Ability to use English grammar accurately.

Course Contents:

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

Reference Book:

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

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.

BCS101: PROGRAMMING FOR PROBLEM SOLVING
Credits: 3
LTP: 3 1 0

Pre-Requisites: NA

Course Description:
This course emphasizes solving problems using the language, and introduces standard programming techniques like alternation, iteration and recursion. It will briefly glimpse the basics of software engineering practices like modularization, commenting, and naming conventions which help in collaborating and programming in teams. This course enables the students to formulate algorithms for arithmetic and logical problems, convert these algorithms to C language programs. It also aims to use arrays, pointers and structures to formulate algorithms and programs.

Course Outcomes (CO):

After completion of this course students will be enable to -

CO1: Create documents using MS-office
CO2: Formulate simple algorithms for arithmetic and logical problems.
C**O3:** Translate the algorithms to programs (in C language)
CO4: Test and execute the programs and correct syntax and logical errors

Course Content:

UNIT I

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.
Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.
Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes**.**

UNIT II

(Loops & Functions)
Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break andcontinue statements.
Functions: Introduction, types of functions, functions with array, passing parameters to functions,call by value, call by reference, recursive functions.

UNIT III

Arrays: Arrays (1-D, 2-D), Character arrays and Strings
Basic Algorithms: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of timecomplexity

UNIT IV

Function and Recursion: Functions (including using built in libraries), Recursion with exampleprograms such as Quick sort, Ackerman function etc.
Structure and Pointers: Pointers, Structures (including self-referential structures e.g., linked list,notional introduction)
File handling: Introduction to file handling and its various modes

Suggested Reference/Textbooks

1. Exploring Microsoft Office 2010 by Robert T. Grauer, Mary Anne S. Poatsy, Michelle Hulett, Cynthia Krebs, KeithMulberry, Prentice Hall.
2. Computer Fundamentals by P.K. Sinha, BPB Pub, 4th Ed.
3. Let Us C by Yashwant Kanitkar
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
5. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
6. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

BCS121: PROGRAMING FOR PROBLEM SOLVING LABORATORY
Credits: 1
LTP: 0 0 2

Pre-Requisites: NA

Course Description:

The purpose of this course is to introduce students to the field of programming using C language. The students will be ableto enhance their analyzing and problem-solving skills and use the same for writing programs in C.

Course Outcomes (CO):

After completion of this course students will be able to -

CO1: Create documents using MS-Office

CO2: Formulate the algorithms for simple problems

CO3: Translate given algorithms to a working and correct program

CO4: Correct syntax errors as reported by the compilers

CO5: Identify and correct logical errors encountered at run time

List of experiments:

Students should be made to practice the various concepts learned in class room by implementing them in the form of programs. Various programs should be practiced in the lab based on each of thefollowing –

1. Create documents using MS-Office exploring its various features.
2. **Problem solving using computers:** Familiarization with programming environment
3. **Variable types and type conversions:** Simple computational problems using arithmeticexpressions
4. **Branching and logical expressions:** Problems involving if-then-else structures
5. **Loops, while and for loops:** Iterative problems e.g., sum of series
6. **1D Arrays: searching, sorting:** 1D Array manipulation
7. **2D arrays and Strings, memory structure:** Matrix problems, String operations
8. **Functions call by value:** Simple functions
9. **Numerical methods:** Root finding, numerical differentiation, numerical integration
10. **Recursion, structure of recursive calls:** Recursive functions
11. **Pointers, structures and dynamic memory allocation:** Pointers and structures
12. **File handling:** File operations

ENS001: ENVIRONMENTAL SCIENCE

Credits: 2

LTP: 0 0 2

Pre-requisites: Nil

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 andmaintain our nature.

Course Outcomes (CO):

After completion of this course, student will be able to

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

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

CO3: Understand natural resources and their uses.

CO4: Recognize about different types of pollution created by human beings and their sideeffects 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.

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 II

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

UNIT III

Environmental Pollution

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

- 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 IV

Human Communities and the Environment

- Human population and growth: Impacts on environment, human health, and welfares.
- Carbon footprint. (G7)
- Resettlement and rehabilitation of project affected persons, case studies.
- Disaster management: floods, earthquakes, cyclones, and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmentalconservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles inDelhi).

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 ConservationBiology. 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). ZedBooks.
8. McNeil, John R. 2000. Something New Under the Sun: An Environmental History of theTwentieth Century.
9. Odum, E.P., Odum, h.T.& Andrews, J.1971. Fundamentals 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 Treatment. 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. UP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Scienceand Conservation, S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from theTropics. 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. OxfordUniversity Press.
21. www.nacwc.nic.in
22. www.opcw.org

SECOND SEMESTER

BTC101: ENGINEERING CHEMISTRY

Credits: 4

LTP: 3 1 0

Pre-requisites: Nil

Course Description: The course aims to equip the students with introduction to crystal field theory and spectroscopic properties, to understand the conditions of chemical equilibrium, periodic properties of elements, molecular shapes, and importance of stereochemistry in organic reactions and explore the synthesis of organic drug molecules.

The course includes quantum chemistry, co-ordination chemistry, solid states, and various spectroscopic techniques, states of matter, thermodynamic and periodic properties, stereochemistry and synthesis of drug molecules.

Course Outcomes (CO):

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

CO1: Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces and crystal field theory to explain aspects of structural, magnetic and spectroscopic properties.

CO2: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levelsin various spectroscopic techniques.

CO3: Rationalize bulk properties and processes using thermodynamic considerations.

CO4: Rationalize periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity and also list major chemical reactions that are used in the synthesis of molecules.

Course Content

UNIT I

Atomic structure & Chemical Bonding: Schrodinger equation. Particle in a box solution and their applications for conjugated molecules. Forms of the hydrogen atom wave functions and the plots of these functions to exploretheir spatial variations. Molecular orbital theory- general introduction and the energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory- general introduction and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the roleof doping on band structures.

UNIT II

Spectroscopic techniques and applications: Principles of spectroscopy and selection rules – Electronic spectroscopy. Fluorescence and its applications in medicine. IR & microwave (Vibrational and rotational spectroscopy of simple diatomic molecules) Applications. Nuclear magnetic resonance and magnetic resonance imaging proton NMR, surface characterization techniques (FTIR & XRD).

UNIT III

Thermodynamics: Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Thermodynamic functions: energy, entropy and free energy.

Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

UNIT IV

Polymers: General introduction, classification of polymers, Mechanism of addition and condensation polymerization, Idea of number average and weight average molecular masses of polymers, Properties and uses of polystyrene, polyester, polyamide, epoxy, phenol- formaldehyde and silicon resins.

Stereochemistry: Representations of three-dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality in organic molecules, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Organic reactions and synthesis of a drug molecule: Introduction to simple reactions substitution, addition, elimination, oxidation, reduction and cyclization. Synthesis of commonly used drug molecules (Aspirin, Metronidazole, Ciprofloxacin).

Recommended Books / Suggested Readings:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs. Wh freeman. Com /vollhardtschore5e/default.asp

BTC 121: ENGINEERING CHEMISTRY LABORATORY

Credits: 1

LTP: 2 0 0

Pre-Requisites: NA

Course Description: The course aims to equip the students with experimental/practical knowledge of illustratingthe principles of chemistry relevant to the study of science and engineering.

The course includes separation techniques, determination of ions in water, rate constants for chemical reactions, cell constants, conductometry, potentiometry, chemical analysis, saponification and chemical oscillations.

Course Outcomes (CO):

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

CO1: Estimate rate constants of reactions from concentration of reactants/products as a function of time. **CO2:** Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.

CO3: Synthesize a small drug molecule/polymer and analyze a salt sample.

CO4: To analyses the inorganic salts and chromatography for separation of compounds.

List of Experiments:

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression.
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres.
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to demonstrate isoelectric point as the pH of minimum viscosity for gelatinsols and/or coagulation of the white part of egg.

BTM202: MATHEMATICS-II

(DIFFERENTAL CALCULUS)

Credits: 4

LTP: 3 1 0

Pre-Requisites: BTM 102

Course Description: The course aims to equip the students with the ability to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables & equip them to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes:

After completion of this course students will be able to -

CO1: Use mathematical tools needed in evaluating multiple integrals and their usage.

CO2: Apply effective mathematical tools for the solutions of differential equations inengineering problems.

CO3: Apply concepts of differentiation and integration of functions of a complex variable thatare used in various techniques dealing engineering problems.

CO4: Deal with functions of several variables that are essential in most branches of engineering.

UNIT I

Multivariable Calculus (Differentiation): Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence

UNIT II

Multivariable Calculus (Integration): Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes; Triple integrals (Cartesian), orthogonal curvilinear coordinates; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes (without Proofs)

UNIT III

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT IV

Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulustheorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

Recommended Books / Suggested Readings:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary ValueProblems,

9th Edn., Wiley India, 2009.

4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- GrawHill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BCS302: OBJECT ORIENTED PROGRAMMING USING C++

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with the basic concepts of object- oriented programming andto find solutions to various real-life problems using C++.

The course includes concepts of OOPs and various computer C++ programs introducing basic knowledge of C++.

Course Outcomes (CO):

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

CO1. Implement the data types, decision control statements, loop statements, and functions in C++.

CO2. Recognize features of object-oriented programming such as classes, objects, encapsulation, abstraction, inheritance, composition, and polymorphism.

CO3. Interpret exception handling and file handling operations.

Course Content

UNIT I

Introduction: Beginning with C++, its applications, advantages etc, Difference between C and C++, Creating C++ source file, Editing, Compiling, Linking, Debugging, Difference between Procedure Oriented Programming approach and Object-Oriented Programming approach.

C++ Fundamentals: Tokens, Keywords, Data Types, Expressions, Operators, Reference variables, and Manipulators. Control Structures: Decision control statements (if, if-else, if-else-if), Looping statements (while, do-while, for), break, continue, switch statements.

UNIT II

Functions: Different types of functions, Argument passing techniques-Pass by value, pass by address, Pass by Reference; Inline functions, Function overloading, Default arguments, Recursion.

Arrays and Strings: Defining arrays, Initialization, passing one-dimensional array to function, multi-dimensional arrays, Defining and initializing string variables.

UNIT III

Structures and Unions: Declaration and definition, initialization, array of structures, Difference between structure and union.

Pointers: Declaration and initialization, array of pointers, pointer to pointer, operations on pointers.

Classes and Objects: Class specification, Class objects, defining member functions, declaration of objects to class, accessing class members with objects, access specifiers (private, public, protected), array of objects, Constructors and Destructors, Operator overloading.

UNIT IV

Inheritance: Public, private and protected inheritance, Friend function, Single inheritance, multi- level inheritance, Multiple inheritance and its ambiguity, Hierarchical inheritance, Hybrid inheritance, Virtual base class, Abstract class,

Composition.

Polymorphism: Compile-time and Run-time polymorphism, Virtual Functions, Pure virtual functions, this pointer.

Exception Handling and File Handling: try-catch block, multiple catch blocks, catching all exceptions, rethrowing exceptions, File handling functions.

Recommended Books / Suggested Readings:

1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, TataMc-Graw Hill.
2. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.
3. Object Oriented Programming in C++ by Robert Lafore
   Let Us C++, Yashwant Kanitk

BCS 322: OBJECT ORIENTED PROGRAMMING LABORATORY

Credits: 1

LTP:2 0 0

Course Description: The course aims to equip the students with basic programming and error correction. The course helps students to solve real life problems.

This course includes OOPs Concepts, Loops, Array, function, recursion, pointers, structures and develop a mini project.

Course Outcomes (CO):

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

CO1: Identify and correct logical errors encountered at run time.

CO2: Use concepts of Object-Oriented Programming

CO3: Create, read and write to and from simple text files.

List of Experiments

1. **Problem solving using computers:** Familiarization with programming environment.
2. **Variable types and type conversions:** Simple computational problems using arithmetic expressions.
3. **Branching and logical expressions:** Problems involving if-then-else structures.
4. **Loops, while and for loops:** Iterative problems e.g., sum of series.
5. **1D Arrays:** searching, sorting: 1D Array manipulation.
6. **2D arrays and Strings, memory structure:** Matrix problems, String operations
7. **Functions call by value:** Simple functions.
8. **Recursion, structure of recursive calls:** Recursive functions
9. **Pointers, structures and dynamic memory allocation:** Pointers and structures
10. **Object Oriented Concepts:** Polymorphism, abstraction, inheritance, encapsulation File handling: File operations

    Create a small project using C++ like Tic-tac-toe, Quiz Game, Hangman

COM201: BUSINESS COMMUNICATION

Credits: 2

LTP:2 0 0

Pre-Requisites: NA

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:

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

CO1: Use persuasive and professional language in speech and writing.

CO2: Demonstrate advanced interpersonal communication, business etiquette and relationship building skills.

CO3: Discuss the importance of ethical communication Ethics in Business Communication.

CO4: Discuss the importance of ethical communication Ethics in Business Communication.

Course Contents:

UNIT I

Communication& Interpersonal Skills: Process of Communication, Types of communication, Modes ofCommunication, Barriers to Communication, Delivering Effective PPT

UNIT II

Technical Writing: Memorandum, Notices, Blog Writing, Report Making, Minutes of Meeting, E-Mail, Press Note, Resume& Cover Letter, Formal Letter- Complaint Letter, Inquiry Letter, Confirmation Letter, Resignation Letter, Permission Letter,

UNIT III

Vocabulary Building: Misspell words; Techno based Acronyms, Word formation- prefix, suffix,Foreign Words, Phrases

UNIT IV

Functional Grammar: Conditional Sentences, Degrees of Comparison, Punctuation, Question Tags

Reference Book:

Functional Skills English by Roselyn Whitley, 2008

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.*

COM221: BUSINESS COMMUNICATION LABORATORY

Credits: 1

LTP:0 0 2

Pre-Requisites: NA

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):

After completion of this course students will be enable 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: Nonverbal communication, interview preparation, resume writing.

Course Contents:

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

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

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.

BME123: WORKSHOP/MANUFACTURING PRACTICES

Credits: 2

LTP:0 0 2

Pre-Requisites: NA

Course Description:

This course is to get familiarized with various trades used in Engineering Workshop and learn the safety pre-cautions to be followed in the workshops, while working with the different tools.

Course Outcomes (CO):

After completion of this course students will be enable to -

CO1: Use one – way, two-way switches, parallel and series connections in house wiring.

CO2: Practices various joints of welding.

CO3: Make use of various fitting tools.

CO4: Will perform Cold & Hot forging.

Course Content

UNIT I

Smithy Shop: Introduction; Forging tools and equipment, Hot working process; Cold working process. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.Introduction to various heat treatment processes e.g annealing, hardening, tempering, normalizing etc.

JOBS

1. To Make a Circular Ring by Cold Forming.
2. To Make a Chisel from Round Bar by Hot Forging.
3. To Forge a Cubical Shape from Round

UNIT II

Fitting Shop: Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminum etc.). Identification of varioussections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc. Description and demonstration of various types of work benches. holding devices and files. Safety Precautions while using tools. Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications,uses and method of fitting the blade. Introduction to various types of threads (internal, external)-single start, multi-start, left hand and right-hand threads. Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selectionof drills and taps for tapping operations.

JOBS

- Prepare a template of given size by hack sawing and filing.
- Prepare a job having internal and external threads.

UNIT III

Electric Shop: Introduction; various electrical materials, Tools & Various electrical instruments used in electric shop, Concept of wiring. Introduction to the construction of a Lead-acid battery and its working. Installation of a battery and to connect two or more batteries in series and in parallel, charging of a battery and testing it with the help of hydrometer and Cell Tester. Importance of three-phase wiring and its effectiveness. Estimating and costing of powerconnection, Safety Measures during electrical works

JOBS

a. To Make Series and Parallel Connections.
b. Domestic Wiring – Connecting Lamp and Fan
c. Stair Case Wiring (2way).
d. Charging and Testing of Battery.

UNIT IV

Welding Shop: Introduction; Types of welding; introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes and their specifications, welding screensand other welding related equipment and accessories. Types of welding joints, Concept of Gas welding; Arc welding; MIG welding; TIG welding; Spot welding, Seam welding, Different welding position, Soldering and Brazing. Safety measures during welding operations.

JOBS

1. Practice Arc Welding.
2. Prepare Lap Joint with Arc Welding.
3. Prepare Butt Joint.
4. Prepare T Joint.

RECOMMENDED BOOKS

1. Workshop Technology Part 1-3 by Chapman W A J , Viva Books Pvt. Ltd, New Delhi.
2. Workshop Technology by Raghuwanshi R S, Dhanpat Rai and Sons, New Delhi.
3. Production Technology by Jain R K, Khanna Publishers, New Delhi.

UHV001: UNIVERSAL HUMAN VALUES

LTP:3 0 0

Course Description: The course aims to equip the students with understanding about the role and importance of human values and ethics in personal, social and professional life. The course introduces the student to enable students to understand and appreciate ethical concerns relevant to modern lives, to help students develop sensitivity and awareness; leading to Commitmentand courage to act on their own belief.

Course Outcomes (CO):

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

CO1: Start exploring themselves and start finding the need and relevance for the course.

CO2: Start finding that technical education without study of human values can generate more problems.

CO3: Realize that only physical facility is not sufficient for a good life.

CO4: See that the 'I' and 'BODY 'are two realities. The feeling is related to 'I 'and physical facility isrelated to 'body'.

CO5: See that respect is the right evaluation and only right evaluation leads to fulfillment in relationship.

CO6: Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.

Course Content

UNIT I

Introduction to value education: understanding the need, basic guidelines, Concept of Human Values: Meaning and Importance of Values, basic human aspiration, Method to fulfill the basic aspiration- SVDD, SSDD, SSSS, Understanding and living in harmony at various levels.

UNIT II

Being good and Responsible, Self-Exploration, Self-Evaluation and Investigation, Natural Acceptance, Understanding the need of self ('I') and 'body'- Sukh and Suvidha, Harmony in Myself:

- Understanding the harmony of 'I' with body, Program to ensure Sanyam and Swasthya.

UNIT III

Understanding Harmony in the Family: Relationships, harmony, Emotions and Feelings, understanding harmony in the Family-The basic unit of human interaction, Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas;Difference between Intention and Competence and other salient values in relationship.

UNIT IV

Understanding Harmony in Society: Comprehensive human goal, Universal human order, Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (SarvabhaumVyawastha)- from family to world family.

UNIT V

Understanding harmony in Nature: Understanding the harmony in Nature, Orders in nature, Interconnectedness and mutual fulfillment among the four orders of nature. Ethical living: - Ethical human conduct, Professional Ethics.

Recommended Books / Suggested Readings:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education
2. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books

3. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA.

THIRD

SEMESTER

BCS 301: DATA STRUCTURE & ALGORITHMS

LTP:3 0 0

Course Description: The course aims to equip the students with the basic concepts of data structuresand algorithms. The course includes concepts about searching and sorting techniques, the basics stacks, queues, lists, trees and graphs, and to enable the students to solve problems with the help of fundamental data structures.

Course Outcomes (CO):

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

CO1: Analyze the algorithms to determine the time and computation complexity and justify thecorrectness.

CO2: Implement linear search and binary search for a given search problem.

CO3: Determine the time and computation complexity for a given problem of Stacks, Queues andlinked lists.

CO4: Implement Graph search and traversal algorithms and determine the time and computationcomplexity.

Course Content

UNIT I

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space tradeoff. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT II

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

UNIT III

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

UNIT IV

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison amongall the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis

Recommended Books / Suggested Readings:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-

Wesley Publishing Company

3. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

BCS321: DATA STRUCTURE & ALGORITHMS LABORATORY

Credits: 1

LTP:3 0 0

Course Description: The course aims to equip the students with the basic concepts of data structuresand algorithms. The course includes the implementation of various searching and sorting techniques along with spaceand time complexity.

Course Outcomes (CO):

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

CO1: Design and implement an efficient data structure to represent given data.

CO2: Implement linear search and binary search for a given search problem

CO3: Implement solutions for the problem of Stacks, Queues and linked lists

CO4: Write programs for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, HeapSort and compare their performance in term of Space and Time complexity

CO5: Implement Graph search and traversal algorithms with the help of programs

List of Experiments

1. **Linear Search**
2. **Binary Search**
3. **Stacks**
4. **Queues:** Simple, Circular, Priority
5. **Linked Lists:** Singly linked list, Doubly Linked List, Circular Linked List
6. **Trees:** Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree
7. **Sorting and Hashing:** Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, HeapSort
8. **Graph:** Graph search and traversal

BCS 209: BASICS OF PYTHON

Credits: 3

LTP:3 0 0

Course Description:

Computer programming skills are now becoming part of basic education as these skills are increasinglyof vital importance for future job and career prospects. The Python programming language which is one of the most popular programming languages worldwide. The course shows you how to use the freeopen-source Python to write basic programs and high-level applications using concepts such as Class,BIF of Python, functions, variables, If Else statements, For loops, While loops, iterative and recursiveprograms and algorithms such as the Insertion Sort algorithm. This course will be of great interest to all learners who would like to gain a thorough knowledge and understanding of the basic componentsof computer programming using the Python language – and might be a gentle introduction to programming for those who think they might have a longer-term interest in the subject area.

Course Outcomes (CO):

Able to apply the principles python programming.

CO1: Write clear and effective python code.

CO2: Create applications using python programming.

CO3: Implementing database using SQLite.

CO4: Access database using python programming.

CO5: Develop web applications using python programming.

CO6: Develop and use Web Services using python.

Course Content:

UNIT I

Introduction to Python Language, Strengths and Weaknesses, Installing IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric DataTypes, Conversions, Built in Functions.

UNIT II

Data Collections and Language Component: Introduction, Control Flow and Syntax, Indenting, the if Statement, Relational Operators, Logical Operators, Boolean Operators, Bit Wise Operators, the whileLoop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections.

UNIT III

Object and Classes: Classes in Python, Principles of Object Orientation, Creating Classes, Instance Method, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes.

UNIT IV

Functions and Modules: Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope, Functions - "First Class Citizens", Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules, Standard Modules – sys, Standard Modules – math, Standard Modules – time, The dir Function.

UNIT V

I/O and Error Handling in Python: Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data from a File, Additional File Methods, Using Pipesas Data Streams, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

UNIT VI

Applications of Python (Data Science/ Cyber/ Cloud): Importance of learning data analysis in python, Building Predictive Models, Python Data Structures, Python Libraries. Python programming and packages, Installation of Jupyter/PyCharm Notebook and Google colab Control Statement, Object oriented programming in Python, Installation of different packages Brief introduction of Packages of Python for different applications. Django: Introduction, Apps, Models and Views and URL Structure.

Recommended Books / Suggested Readings:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.
2. Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014.
3. Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176.
5. Reema Thareja, "Python Programming using problem solving approach", Oxford University press, 2017. ISBN-13: 978-0199480173.
6. Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1 st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278.

BCS 222: BASICS OF PYTHON LABORATORY

Credits: 1

LTP:0 0 2

Course Description: The Python programming language which is one of the most popular programming languages worldwide. The course shows you how to use the free open-source Python towrite basic programs and Python, functions, variables, If Else statements, For loops, While loops, iterative and recursive programs and algorithms such as the Insertion Sort algorithm.

Course Outcomes (CO):

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

CO1: Develop essential programming skills in Python programming.

CO2: Write clear and effective python code.

CO3: Develop the Python programs stepwise by defining functions and calling them.

CO4: Apply the concept of conditionals and loops in Python programs.

List of Experiments

1. Write a python program to print Hello World.
2. Write python program to Hello World using string variable.
3. Write python program to store data in list and then try to print them.
4. Write python program to do basic trim and slice on string.
5. Write a python program to print list of numbers using range and for loop.
6. Write a python program to store strings in a list and then print them.
7. Write python program to let user enter some data in string and then verify data and print welcome touser.
8. Write python program in which a function is defined and calling that function prints Hello World
9. Write python program in which a function (with single string parameter) is defined and calling thatfunction prints the string parameters given to function.
10. Write a python program in which a class is defined, then create the object of that class and call simpleprint function defined in class.

BEE302: Digital Circuits and Logical Design

Credits: 3

LTP 300

Course Description: The course aims to equip the students with the formal procedures for the analysis and design of combinational and sequential circuits.

The course includes introduction to basic postulates of Boolean algebra and shows the correlation between Boolean expressions, introduce the methods for simplifying Boolean expressions and also introduce the concept of memories and programmable logic devices.

Course Outcomes (CO):

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

CO1: Analyze different methods used for simplification of Boolean expressions.

CO2: Design and implement Combinational and Sequential circuits.

CO3: Design and implement Synchronous and Asynchronous Sequential Circuits.

Course Content

Unit I

Number Systems and Boolean Algebra: Number systems, Binary addition and Subtraction, Subtraction using 1's & 2's complements and using 9's &10'scomplements, Binary codes, Error detecting and Correcting codes, Theorems of Boolean algebra, Canonical forms, Logic gates.

Combinational Circuits: Representation of logic functions, Simplification using Karnaugh map, Tabulation method, Implementation of combinational logic using standard logic gates, Multiplexers and DE multiplexers, Encoders and Decoders, Code Converters, Adders, Subtractors, Parity Checker and Magnitude Comparator

Unit II

Sequential Circuits: Flip flops SR, JK, D and T flip flops Level triggering and edge triggering, Excitation tables Counters -Asynchronous and synchronous type modulo counters, design with state equation state diagram, Shift registers, type of registers, circuit diagrams.

Digital Logic Families: Introduction to bipolar Logic families: RTL, DCTL, DTL, TTL, ECL and MOS Logic families: NMOS, PMOS, CMOS, Details of TTL logic family -Totem pole, open collector outputs, TTL subfamilies, Comparison of different logic families.

UNIT III

D/A and A/D Converters: Weighted resistor type D/A Converter, Binary ladder D/A converter, Steady state accuracy test, D/A accuracy and resolution, Parallel A/D Converter, counter type A/D converter, Successive approximation A/D converter, Single and Dual slope A/D converter, A/D -accuracy and resolution.

UNIT IV

Semiconductor Memories: Memory organization, Classification, and characteristics of memories, Sequential memories, ROMs, R/W memories, Content Addressable memories, Charged-Coupled Device memory, PLA, PAL and Gate Array.

Recommended Books / Suggested Readings:

1. Wakerly J F, Digital Design: Principles and Practices, Prentice-Hall, 2nd Ed., 20022.

2. D. D. Givone, Digital Principles and Design, Tata Mc-Graw Hill, New Delhi, 2003.
3. S. Brown and Z. Vranesic, Fundamentals of Digital Logic with Verilog Design, Tata Mc-Graw Hill, 2008.

BEE322: DIGITAL CIRCUITS AND LOGICAL DESIGN LABORATORY

Credits: 1

LTP:0 0 2

Course Description: The course aims to equip the students with practical experience in design, realization and verification of Dorgan's Theorem, SOP, POS forms.

The course includes Full/Parallel Adders, Subtractors and Magnitude Comparator, Multiplexer using logic gates, Demultiplexers and Decoders, Flip-Flops, Shift registers and Counters.

Course Outcomes (CO):

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

CO1: Demonstrate the truth table of various expressions and combinational circuits using logic gates.

CO2: Design, test and evaluate various combinational circuits such as adders, subtractors, comparators, multiplexers and de-multiplexers.

CO3: Construct flips-flops, counters and shift registers.

CO4: Develop a digital logic and apply it to solve real life problems.

List of Experiments:

1. Design and verification of the truth tables of Half and Full adder circuits
2. Design and verification of the truth tables of Half and Full subtractor
3. Design and implementation of 4-bit binary Adder/ Subtractor and BCD adder using IC7483
4. Design and implementation of code converters using logic gates
5. BCD to excess-3 code
6. Binary to gray code
7. Verification of the truth table of the Multiplexer using IC 74150
8. Verification of the truth table of the De-Multiplexer using IC 74154
9. Design and test of an SR flip-flop using NOR/NAND gates
10. Verify the truth table of a D flip-flop (7474) and JK flip -flop (7476)
11. Verification of the results of 3-bit synchronous up/down counter
12. Verification of 4-bit ripple counter and Mod -10 / Mod-12 Ripple counters
13. Operate the universal shift register 74194
14. Operate a 7 segment LED display through a counter using a low frequency clock.

BTM302: MATHEMATICS – III

(PROBABILITY AND STATISTICS)

Credits: 4

LTP:4 0 0

Pre-Requisites: NA

Course Description:

The course aims to equip the students with the ability to familiarize the students withstatistical techniques and to equip them with standard concepts and tools at an intermediateto advanced level that will serve them well towards tackling various problems in the discipline.

Course Outcomes:

After completion of this course students will be able to -

CO1: Describe the ideas of probability and random variables and various discrete and continuous probability distributions and their properties.

CO2: Discuss and implement the basic ideas of statistics including measures of central tendency, correlation and regression.

CO3: Understand the statistical methods of studying data samples.

CO4: Describe and implement the basic ideas of statistics including Curve fitting by method of least squares and testing of significance.

UNIT I

Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, Expectation of Discrete Random Variables, Moments, Variance of a sum.

UNIT II

Continuous Probability Distributions: Continuous random variables and their properties, distribution functions.

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions

Bivariate Distributions: Bivariate distributions and their properties, distribution of sums and quotients, Bayes' rule.

UNIT III

Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Correlation and regression – Rank correlation.

UNIT IV

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Small samples: Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Recommended Books / Suggested Readings:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
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. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

DOS001: FOUNDATION COURSE IN HUMANITIES

(Development of Societies/Philosophy)Credits: 3

LTP:3 0 0

Course Description:

This course will introduce you to some of the main areas of contemporary philosophy. This course willbe an introductory overview of several different areas of philosophy.

Course Outcomes:

After completion of this course students will be able to -

CO1: To understand the right way of thinking.

CO2: To equip the students to understand or to deal with the status of morality.

CO3: To compare the human mind with a machine.

CO4: To familiarize with the obligation of obeying law.

CO5: To study the contributions of greatest philosophers and medieval thinkers.

Course Contents:

Unit-I

The difference between knowledge (Vidya) and Ignorance (Avidya): a. Upanishads; b. Six systems orthodox and Heterodox Schools of Indian Philosophy. Greek Philosophy

Origin of the Universe: • NasidiyaSukta: "Who really knows?"

Brhadaranyaka Upanishad; Chandogya Upanishad: Non-self, Self, real and unreal.

Plato's Symposium: Lack as the source of desire and knowledge.

Socratic's method of knowledge as discovery.

Fourteen Knowledge basis as a source of Vidya: Four Vedas; Six auxiliary sciences (Vedangas); Purana, Nyaya, Mimamsa and Dharma Sastras.

Unit-II

Knowledge as Power: Francis Bacon. Knowledge as both power and self-realization in Bagavad Gita.

Knowledge as oppression: M. Foucault. Discrimination between Rtam and Satyam in Indian Philosophy.

Unit -III

Knowledge as invention: Modern definition of creativity; scientific activity in the claim that science invents new things at least through technology.

Unit-IV

Knowledge about the self, transcendental self; knowledge about society, polity and nature.

Knowledge about moral and ethics codes.

Recommended Books / Suggested Readings:

1. Copleston, Frederick, History of Philosophy, Vol. 1.Great Britain: Continuum.
2. Hiriyanna, M. Outlines of Indian Philosophy, MotilalBanarsidass Publishers; Fifth Reprint edition (2009)
3. Sathaye, Avinash, Translation of NasadiyaSukta
4. Ralph T. H. Griffith. The Hymns of the Ṛgveda. MotilalBanarsidass: Delhi: 1973.
5. Raju, P. T. Structural Depths of Indian Thought, Albany: State University of New York Press.

6. Plato, Symposium, Hamilton Press.
7. KautilyaArtha Sastra. Penguin Books, New Delhi.
8. Bacon, Nova Orgum
9. Arnold, Edwin. The Song Celestial.
10. Foucault, Knowledge/Power.
11. Wildon, Anthony, System of Structure.
12. Dasgupta, S. N. History of Indian Philosophy, MotilalBanasidas, Delhi.
13. Passmore, John, Hundred Years of Philosophy, Penguin.

BCS501: COMPUTER NETWORKS

Credits: 3

LTP:0 0 2

Course Description: The course aims to equip the students with understanding of modern network architectures from a design and performance perspective.

The course introduces the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs), to provide an opportunity to do network programming, to provide a WLAN measurement idea.

Course Outcomes (CO):

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

CO1: Understand the functions of the different layers of the OSI Protocol.

CO2: Understand the basics of how data flows and understand the function of wide-area networks (WANs), local area networks (LANs) and Wireless LANs.

CO3: Analyze protocols for various functions in the network.

CO4: Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme.

CO5: Understand DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls

Course Content:

UNIT I

Data communication Components: Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT II

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA

UNIT III

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP– Delivery, Forwarding and Unicast Routing protocols.

UNIT IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW

, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

Recommended Books / Suggested Readings:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGrawHill
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America

BCS521: COMPUTER NETWORKS LABORATORY

Credits: 1

LTP:0 0 2

Course Description: The course aims to equip the students with an understanding of modern networkarchitectures from a design and performance perspective.

The course introduces the student to the major concepts involved in wide-area networks (WANs), localarea networks (LANs) and Wireless LANs (WLANs), to do network programming, to provide a WLAN measurement idea.

Course Outcomes (CO):

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

CO1: Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs)and Wireless LANs (WLANs) describe the function of each block.

CO2: Design for a given requirement (small scale) of wide-area networks (WANs), local areanetworks (LANs) and Wireless LANs (WLANs) based on the market available component.

CO3: Develop network programming for a given problem related to TCP/IP protocol.

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP,SNMP, Bluetooth, Firewalls using open-source available software and tools.

List of Experiments:

1.Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool,Connectors etc.

2.Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc

3.Preparing straight and cross cables.

4.Configuration of TCP/IP Protocols in Windows.

5.Connect two computers with each other and ping in packet Tracer.

6.Connect with other computers in LAN (Configure the IP address and How to Connect with OtherPCs).

7.Distinguish between Hub and Switch using packet Tracer.

8.Configure network Topologies using packet tracer software.

9.Configure a hybrid network (wired and wireless) in packet tracer.

10. Configure a network using Routers, Switches, Access Points to show the functionality of LAN withWAN.
11. Designing and implementing Class A, B, C Networks.
12. Configure a Network and verify ARP protocol.
13. Network Commands (ping, trace route, DNS tools, Telnet, IP config, FTP clients).
14. Configure Network using DHCP protocol.
15. Configure an ICMP protocol on Packet Tracer.
16. Configure Network using various Routing protocols like., RIP.
17. Subnet planning and its implementation.
18. Implementation of various LAN protocols and configurations

FOURTH

SEMESTER

BCS401: OPERATING SYSTEMS

Credits: 3

LTP:3 0 0

Course Description: his course enables to understand importance of Operating System, its functionalities to manage resources of Computer and Peripherals, program development and its execution. Student will be made aware of Process Management, Memory Management, File Management and I/O Management in detail, which will be useful to them for Large Application Development in engineering field with emphasis given to Linux type of Open-Source Operating System.

Course Outcomes (CO):

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

CO1: Understand the fundamental concepts, design principles, and implementation techniques of modern operating systems**.**

CO2: Understand and apply the algorithms for resource management and scheduling.

CO3: Apply the various memory management strategies.

CO4: Discuss problems arising due to concurrency and related synchronization-based solutions**.**

CO5: Understand and implement different file systems.

UNIT I

Basics: Operating System Functionalities, systems stack and role of OS, resources, abstractions and interfaces, Components, Types of Operating Systems, Computer Architecture support to Operating Systems.

Process Management: Threads, Process Scheduling - Uniprocessor scheduling algorithms, Multiprocessor and Real-time scheduling algorithms, Process Synchronization - Peterson's Solution, Bakery. Algorithm, Hardware Support to Process Synchronization, Semaphores, Critical Regions, Monitors - Deadlock prevention, deadlock avoidance and Deadlock Detection and Recovery - Bankers Algorithm.

UNIT II

Memory Management: Address bus and memory access, Memory view of a process- heap, stack, code, data Process memory usage requirements, The address space abstraction using virtual memory and related system calls (mmap, munmap, sbrk, mprotect), Address translation mechanisms-static mapping, segmentation, paging Page faults, page sharing, read/write permissions, swapping, process vs. OS memory ,Memory bookkeeping and management- motivation and mechanisms (process and OS), Case studies -(i) malloc and (ii) role of OS for program to process.

UNIT III

Concurrency and Synchronization: Motivation -application, process and OS use cases. Introduction to threads and the pthread, API Synchronization primitives-limitations of software solutions, atomic instructions, test-and-set, spinlocks, mutexes, condition variables, semaphores, Introduction to the pthread synchronization API, Case studies-producer consumer, reader-writers, barriers Discussion on issues with concurrency-race conditions, deadlocks, order violation.

UNIT IV

File systems: Contiguous, Sequential and Indexed Allocation, File system interface, File System implementation, Case study of Unix File system, Mounting and Unmounting files systems, FAT, NTFS, DFS, Apple File System, Network File systems.

Suggested Readings:

1. Modern Operating Systems, Andrew S. Tannenbaum and Herbert Bos, Pearson Education India; 4th edition
2. Operating System Concepts, Avi Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley India; 9th, edition
3. Operating System courses offered on NPTEL, https://nptel.ac.in/
4. Think OS, A Brief Introduction to Operating Systems. Allen B. Downey
5. Linux Kernel Development, Robert Love, Pearson Education India; 3rd edition
6. Operating Systems: Principles and Practice, Thomas Anderson, Michael Dahlin, Recursive Books; 2nd Edition, https://ospp.cs.washington.edu/index.htm.

BCS421: OPERATING SYSTEMS LABORATORY

Credits: 1

LTP:0 0 2

Course Description: This lab course introduces the fundamental concepts of operating system design and their implementation. The course will include introduction to basic and advanced Linux commands, shell programming, CPU scheduling, memory management, File Systems in the LINUX environment.

Course Outcomes (CO):

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

CO1: Write shell scripts in Linux/UNIX environment.

CO2: Understand the concepts to identify, create and maintain the basic command in operating systems.

CO3: Apply process management through commands in LINUX.

CO4: Apply shell scripts and their execution, shell variables, statements and creation of shell programs for automation of tasks

List of Experiment:

1. Study of Basic commands of Linux/UNIX.
2. Study of Advance commands and filters of Linux/UNIX.
3. Write a shell script to generate marksheet of a student. Take 3 subjects, calculate and display total marks, percentage and Class obtained by the student.
4. Write a shell script to find factorial of given number n.
5. Write a shell script which will accept a number b and display first n prime numbers as output.
6. Write a shell script which will generate first n fibonnacci numbers like: 1, 1, 2, 3, 5, 13, …
7. Write a menu driven shell script which will print the following menu and execute the given task.
8. Display calendar of current month
9. Display today’s date and time
10. Display usernames those are currently logged in the system
11. Display your name at given x, y position
12. Display your terminal number
13. Write a shell script to read n numbers as command arguments and sort them in descending order.
14. Write a shell script to display all executable files, directories and zero sized files from current directory.
15. Write a shell script to check entered string is palindrome or not.
16. Shell programming using filters (including grep, egrep, fgrep)
17. Study of Unix Shell and Environment Variables.
18. Write a shell script to validate the entered date. (eg. Date format is : dd-mm-yyyy).
19. Implementation of CPU scheduling policy in Linux
20. Implement a memory management policy in Linux
21. Implement a file system in Linux

BCS303: COMPUTER ORGANIZATION & ARCHITECTURE

Credits: 3

LTP:3 0 0

Course Description: This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems.

Course Outcomes (CO):

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

CO1: Understand the major components of a computer system and state their function and Purpose.

CO2: Discuss the microstructure of a basic microprocessor and DMA.

CO3: Identify basic components and design of the CPU: the ALU and control unit.

CO4: Classify and describe the operation and hierarchy of Memory.

UNIT I

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Flynn's Classification of Computers, Data representation: signed number representation, fixed and floating-point representations, character representation. Register Transfer and Microoperations: Register transfer language- Register transfer- Bus and Memory transfers – Arithmetic, logic and shift micro-operations. Arithmetic Operations.

UNIT II

Introduction to 8085 architectures: Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses;.8085 Microprocessor interfacing: 8255 Programmable Peripheral Interface, Direct Memory Access (DMA)and 8257 DMA controller - 8255A Programmable Peripheral Interface, Interrupts, Basic Interfacing applications.

UNIT III

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT IV

Memory & its organization: Memory and its types, Memory interleaving, concept of hierarchical memory organization, cache memory, virtual memory, CAM.

Suggested Readings:

1. Mano, Morris M., Computer System Architectue, Prentice Hall (1992) , 3rd ed
2. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier
3. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.
4. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
5. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education
6. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education

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BCS333: COMPUTER ORGANIZATION & ARCHITECTURE LABORATORY

Credits: 1

LTP:0 0 1

Course Description: This lab course discusses the basic structure and operation of a digital computer and used for understanding the organization of various units such as control unit, Arithmetic and Logical unit in a digital computer, architecture and assembly language programming of 8085 microprocessor.

Course Outcomes (CO):

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

CO1: Assemble personal computer.

CO2: Implement the various assembly language programs for basic arithmetic and logical operations.

CO3: Demonstrate the functioning of microprocessor/ based systems with I/O interface.

List of Experiment:

1.Computer Anatomy- Memory, Ports, Motherboard and add-on cards, assembly and disassembly

2.Introduction to 8085 kit and basic instructions

3.Addition/ Subtraction of two 8-bit numbers, sum 8-bit.

4.Find 1's/2's complement of 8-bit number.

5.To compare two 8-bit numbers.

6.Shift an 8-bit no. by one bit.

7.Find Largest of two 8-bit numbers.

8.Find Largest among an array of ten numbers (8 bit).

9.Sum of series of 8-bit numbers.

10. Addition and subtraction of two 16-bit numbers, sum 16 bits.
11. Implement of Booth's algorithm for arithmetic operations.
12. Find 1's and 2's complement of 16-bit number.
13. Implement simple programs using I/O based interface.
14. Write a shell script to display all executable files, directories and zero sized files from current directory.
15. Write a shell script to check entered string is palindrome or not.
16. Shell programming using filters (including grep, egrep, fgrep)
17. Study of Unix Shell and Environment Variables.
18. Write a shell script to validate the entered date. (eg. Date format is : dd-mm-yyyy).
19. Implementation of CPU scheduling policy in Linux
20. Implement a memory management policy in Linux
21. Implement a file system in Linux

BTM402: DISCRETE MATHEMATICS

Credits: 4

LTP:4 0 0

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: Implement the working with mathematical notation and common concepts in discrete mathematics.

CO2: Understand the basic concepts in set theory, logic, combinatorics, and graph theory. **CO3:** Identify the challenges for theoretical Computer Science and its contribution to other sciences.

CO4: Solve real world problems using graphs and trees.

Course Content:

UNIT I

Sets, relations and functions: Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.

Relation: Definition, types of relation, composition of relations, Inverses Function: Definition and types of function, composition of functions, Inverses.

UNIT II

Propositional logics: Introduction to first order logic and first order theory, Syntax and Semantics, proof systems, satisfability, validity, soundness, completeness, deduction theorem etc.

Partially ordered sets: Complete partial ordering, chain, and lattice, complete, distributive, modular and complemented lattices. Boolean lattices.

UNIT III

Algebraic Structures: Algebraic structures with one binary operation – semi-group; monoid and group; cosets; Lagrange theorem; normal subgroup; homomorphic sub-group congruence relation and quotient structures, error correcting code; algebraic structures with two binary operations; ring; integral domain and field; Boolean algebra and Boolean ring (Definition and simple examples)

UNIT IV

Introduction to Counting: Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.

Introduction to Graphs: Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees- All definitions and simple example.

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 Mc Graw Hill, 2005. 4. Deo N., Graph Theory, Prentice Hall of India.

4. Trembley J.P. & Manohar R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill.

BCS402: JAVA PROGRAMMING

Credits: 3

LTP:3 0 0

Course Description:

The course aims to equip the students with fundamentals of object-oriented programming in Java. Thecourse includes as variables, conditional and iterative execution, methods in JAVA, fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.

Course Outcomes (CO):

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

CO1: Demonstrate the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.

CO2: Use object-oriented programming concepts such as classes, objects, constructors, data hiding, inheritance and polymorphism to solve a given problem.

CO3: Implement the inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.

CO4: Illustrate how robust programs can be written in Java.

CO5: Write Graphical User Interface based application programs by utilizing event handling features and Swing in Java.

Course Content

UNIT I

Introduction: The Evolution of Java, Object-Oriented Programming Concepts and Java, Two paradigms, Differences between C++ and Java, The Primary Characteristics of Java, The Architecture,Java class libraries, Java Virtual Machine, Data types, Tokens, Literals, Variable and scope, SymbolicConstants, Data type, Type casting, Operators, Wrapper classes, Installation of Java and IDE(Netbeans/Eclipse)

Control Statements: Introduction, Control Statements, Sequence Control Statement, Decision Control Statement, Case Control Statement, Iteration Control Statement, Jump in Loops, Labeled Loops.

UNIT II

Arrays: Introduction, Array, Need of Array, Types Of Array, One Dimensional Array, Multidimensional Array, Memory representation of Arrays.

Strings: Introduction, String Methods, String Buffer.

Classes: Introduction, Defining A Class, Adding Variables, Adding Methods, Creating Objects, Accessing Class Members, Call by Value and Call by Reference, Recursion, Access Control, Constructors, Method Overloading, Constructor Overloading, Garbage Collection, Finalize () Method,This Keyword, Static Members, Nesting of Methods.

UNIT III

Inheritance: Inheritance, Types of Inheritance, Using Super, Constructor -Order of Execution in Inheritance, Overriding Methods, Final Keyword, Abstract Methods and Classes, Visibility ControlInterface

Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASS PATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces,

variables in interface and extending interfaces.

Exception handling: Exception handling fundamentals, Exception types, Uncaught Exceptions Using try and catch, multiple catch clauses, nested try statements throw, finally Java built in exception creating your own exception sub classes, using exceptions.

UNIT IV

Multithreaded Programming: The Java thread model, the main thread, creating thread, creating multiple thread, using isalive(), yield(), sleep() and join(). Thread priorities, synchronization, inter thread communications, daemon threads, suspending, resuming and stopping threads.

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

UNIT V

AWT & Swing: Introduction, Components AWT, Introduction to Swing, limitations of AWT, MVC architecture, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons, JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

Recommended Books / Suggested Readings:

1. Java 2: The Complete Reference by Tata McGraw Hill
2. Head First Java by Kathy Sierra
3. Core Java-I (Addison Wesley) by Horstmann
4. Thinking in Java by Bruce Eckel
5. Java: How to program by Deitel & Deitel Modern Operating Systems - Andrew S. Tenenbaum,Pearson Education Asia / PHI

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BCS422: JAVA PROGRAMMING LABORATORY

Credits: 1

LTP:0 0 1

COURSE OVERVIEW: A Java Programming lab manual is intended to provide a basic knowledge of java programming for students. To develop software development skills in java programming and Students will have the proficiency to develop projects in java programming. The course helps the students to solve interdisciplinary applications through java programming.

COURSE OUTCOMES: At the end of the course students will be able to:

CO1: Write Java programs using the object-oriented concepts - classes, objects, constructors, data hiding, inheritance, and polymorphism.

CO2: Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs.

CO3: Design, code and debug various programs in Java Programming Language.

CO4: Write Graphical User Interface based application programs by utilizing event handling features and Swing in Java

List of Experiments

1. Write a Java program that prints all real solutions to the quadratic equation ax2 +bx + c = 0. Readin a, b, c and use the quadratic formula. If the discriminate b2 -4ac is negative, display a messagestating that there are no real solutions.
2. The Fibonacci sequence is defined by the following rule: The first two values in the sequence are1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non-recursive functions to print the nth value in the Fibonacci sequence.
3. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (Use Scanner class to read input)
4. Write a Java program to multiply two given matrices.
5. Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM isa palindrome.
6. Write a Java program for sorting lists of names. Read input from command line.
7. Write a Java program to make frequency count of words in each text.
8. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascendingorder.
9. Write a Java program to create a student class with the following fields i. Hall ticket number ii. Student Name iii. Department Create ‘n’ number of Student objects where ‘n’ value is passed as input to constructor.
10. Write a Java program to demonstrate String comparison using == and equals method.
11. Write a java program to create an abstract class named Shape that contains an empty method named number Of Sides (). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method number Of Sides () that shows the number of sides in the given geometrical figures.
12. Write a Java program to read copy content of one file to another by handling all file related exceptions.
13. Write a Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file andthe length of the file in bytes.

14. Write a Java program that reads a file and displays the file on the screen, with a line number beforeeach line.
15. Write a Java program that displays the number of characters, lines and words in a text file.
16. Write a Java program that creates three threads. The first thread displays “Good Morning” everyone second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.
17. Write a Java program that correctly implements producer consumer problem using the concept ofinter thread communication.
18. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.
19. Write a Java program for handling mouse events.
20. Write a Java program for handling key events using Adapter classes.
21. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
22. Write a Java program that allows the user to draw lines, rectangles and ovals.
23. Develop simple calculator using Swings.

BCS502: DATABASE MANAGEMENT SYSTEMS

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with understanding of different issues involved in the design and implementation of a database system. Database is an integral part of real-life application system. The course will enable student understand the different issues involved in the design and implementation of a database system. Student will learn the physical and logical database designs, database modelling, relational, hierarchical, and network models. Student will learn to use data manipulation language to query, update, and manage a database. Student will understand essential DBMS concepts such as: database security, integrity, concurrency, storage strategies etc.

Course Outcomes (CO):

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

CO1: Describe the features, types of a database system and its application and compare various types of data models.

CO2: Construct an ER Model for a given problem and transform it into a relation database schema.

CO3: Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.

CO4: Describe different approaches of Normalization, transaction processing and concurrency control.

UNIT I

Introduction: An overview of database management system, database system vs file system, database system concepts and architecture, views of data – levels of abstraction, data models, schema and instances, data independence, database languages and interfaces, data definition languages, DML, overall database structure, transaction management, storage management, database users and administrator.

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree**.**

UNIT II

Relational Database Concepts: Introduction to relational database, relational database structure, relational model terminology-domains, attributes, tuples, relations & relational database schema, integrity constraints, entity integrity, referential integrity, keys constraints, domain constraints, Relational algebra - relational calculus, tuple and domain calculus, basic operations-selection and projection, set-theoretic operations, join operations.

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, & third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

UNIT III

Structured Query Language (SQL): Basics of SQL, DDL, DML, DCL, advantage of SQL, SQL data type and literals, types of SQL commands, SQL operators and their procedure, tables – creation & alteration, defining constraints, views and indexes, queries and sub queries, aggregate functions, built-in functions, insert, update and delete operations, joins, unions, intersection, minus, transaction control commands.

Transaction Processing Concepts: Transaction concepts, properties of transaction, testing of serializability, Serializability of schedules, Locking, conflict & view serializable schedule, recoverability, recovery from transaction failures, two-phase commit protocol, log-based recovery, checkpoints, deadlock handling.

UNIT IV

Concurrency Control Techniques: Concurrency control, locking techniques for concurrency control, time stamping protocols for concurrency control, validation-based protocol, multiple granularity, multi-version schemes, recovery with concurrent transaction.

Recent Trends in Database Management Systems: Centralized and Client-Server Architectures, Distributed Databases, Object-Oriented Database, Spatial & Temporal Databases, Decision Support Systems, Data Analysis, Data Mining & Warehousing, Data Visualization, Mobile Databases, OODB & XML Databases, Multimedia & Web Databases, Spatial and Geographical Databases, Web and Mobile Databases, Active Databases

Suggested Readings:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.
4. Elmasri, Navathe, "Fundamentals of Database System", Addision Wesley.
5. Bharti P.K., "An Introduction to Database Systems", JPNP.
6. O'Neil, "Databases", Elsevier Pub.

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BCS522: DATABASE MANAGEMENT SYSTEMS LABORATORY

Credits: 1

LTP:0 0 1

Course Description: This course introduces the core principles and techniques required in the design and implementation of database systems. This introductory application-oriented course covers the relational database systems RDBMS - the predominant system for business scientific and engineering applications at present. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

Course Outcomes (CO):

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

CO1: Apply SQL to find solutions to a broad range of queries.

CO2: Apply the basic concepts of Database Systems and Applications.

CO3: Analyse a given database application scenario to use ER model for conceptual design of the database.

CO4: Recognize the purpose of query processing, optimization and demonstrate the SQL query evaluation.

List of Experiment:

1. (i) Exercise in ER design for an application starting with natural language description (ii) Convert ER design to tables (iii) Pen-and-paper exercises with FDs and normalization
2. To study DDL-create and DML-insert commands
3. Create table and insert sample data in tables.
4. Perform queries involving predicates LIKE, BETWEEN, IN etc.
5. To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.
6. To study Single-row functions.
7. Displaying data from Multiple Tables (join)
8. To apply the concept of Aggregating Data using Group functions.
9. To solve queries using the concept of sub query.
10. To apply the concept of security and privileges
11. To study Transaction control commands
12. Exercises on conflicts, cycles, conflict serializability, recoverability, etc.
13. Procedures
14. Write Cursor
15. Write Trigger

FIFTH

SEMESTER

BCS602: SOFTWARE ENGINEERING

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with different basic principles of software application on software projects.

This course includes software development life cycle, development models and agile software development analysis & design, software project management and software quality assurance as well as testing approaches

Course Outcomes (CO):

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

CO1: Identify the need for engineering approach to software development and various processes of requirements analysis engineering problems.

CO2: Analyze various software engineering models and apply methods for design and development of software

CO3: Work with various techniques, metrics and strategies for Testing software projects.

CO4: Recognize how to ensure the quality of software product, different quality standards and software quality

CO5: Apply standards, CASE tools and UML techniques for engineering software projects.

Course Content

UNIT I

Software Engineering: The software problem, Evolution of Software Engineering, Principles of software e Software Development vs. Software Engineering.

Software Process: Software Process, Selection of appropriate process model, Software Process Models- Wate Prototyping, Agile Methodology- such as Scrum and XP.

UNIT II

Advanced Requirement Analysis & Design: Analysis Principles, SRS, Requirement Elicitation Techniques QFD, Design Principles, Design Concepts, Data Design, Architectural Design-Architectural Styles, Procedural

UNIT III

Software Project Management: The Management Spectrum, Software Project Planning and its characteristi metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models- Activity Networks- COCOMO-I, COCOMO-II, Risk Assessment- Probability Matrix, Risk Management

UNIT IV

Software Testing: Testing Fundamentals- Error/Fault/Failure, Testing Principles, Test Cases, TestingTechniqu & Black Box, Unit Testing, Integration Testing, System Testing, Verificationand Validation Testing, Accepta

UNIT V

Software Quality Management: S/W Quality, Importance of S/W Quality, Quality Metrics, QualityStanda Change Control, Change Control Process.

Advanced S/W Engineering: CASE Tools, Reverse Engineering, Re-engineering, Web Engineering.

UML: Modeling UML Use Case Diagrams and Capturing Use Case Scenarios, E-R Modeling from the Probl Identifying Domain Classes from the Problem Statements, State chart and Activity Modeling, Modeling UML Diagrams and Sequence diagrams, Modeling Data Flow Diagrams, Estimation of Test Coverage Metrics

Complexity, Designing Test Suites

Recommended Books / Suggested Readings:

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (6th ed.), McGraw- Hill, 2006
2. P. Jalote, An Integrated Approach to Software Engineering (3rd ed.), Naros Publishing House, 2005.
3. Ian Sommerville, Software engineering, Pearson education.

BCS503: FORMAL LANGUAGE & AUTOMATA THEORY

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with understanding of equivalence of languages accepted by Push down Automata and languages generated by context free grammars

The course introduces the student to develop a formal notation for strings, languages and machines, todesign finite automata to accept a set of strings of a language, to prove that a given language is regularand apply the closure properties of languages, to design context free grammars to generate strings froma context free language and convert them into normal forms

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:**CO1:** Write a formal notation for strings, languages and machines.

CO2: Design finite automata to accept a set of strings of a language.

CO3: Determine whether the given language is regular or not for a given language.

CO4: Execute the Query optimization algorithms for a given language.

CO5: Determine equivalence of languages accepted by Push Down Automata and languagesgenerated by context free grammars.

CO6: Write the hierarchy of formal languages, grammars and machines.

Course Content

UNIT I

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy oflanguages.

UNIT II

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata.

UNIT III

Context-free languages and pushdown automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

UNIT IV

Context-sensitive languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

UNIT V

Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalizationlanguages, reduction between languages and Rice s theorem, undecidable problems about languages.

Recommended Books / Suggested Readings:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia Harry R. Lewis and Christos H. Papadimitriou,Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

BCS504: WEB TECHNOLOGIES

Credits: 3

LTP:3 0 0

Course Description: The course aims to make student aware with the basic of web development.

The need for Internet-based apps is growing by the day in this digital age. To immerse learners in the Internet-driven environment and prepare them to design diverse web-based applications. The course includes knowledge of HTML, CSS, XML, AJAX & real time query processing.

Course Outcomes (CO):

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

CO1: List the various HTML tags and use them to develop the user-friendly web pages.

CO2: Create interactive web pages to improve the user experience using client-side scripting with JavaScript.

CO3: Apply advanced asynchronous web communication mechanisms like AJAX and jQuery for building highly interactive webpages.

CO4: Use server-side scripting with PHP to generate the web pages dynamically using the database connectivity.

Course Content

UNIT I

HTML: Introduction to HTML, formatting text, Lists, adding graphics to HTML page, creating tables,linking documents, frames, DHTML and Style sheets, working with images, maps and forms.

Introduction to CSS: Introduction to CSS, Block and Inline Elements, Inline Styles, using internal CSS, using external CSS, How CSS rules cascade, inheritance, why use external style sheets?

UNIT II

Javascript: Introduction, programming constructs: variables, operators, statements and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, handling events and working with objects, creating and processing forms, using hidden fields and cookies, introduction to Cookies, working with links and images, Introduction to jQuery, jQuery effects, jQuery get, set contents and Atrributes.

UNIT III

XML: XML syntax rules, XML elements, XML attributes, creating an XML document, using element,declaration and examination, using XML in an HTML document, XML DTD displaying XML with CSS.

UNIT IV

AJAX: Introduction, HTTP request, XMHttpRequest, AJAX Server Script, AJAX Database.

UNIT V

PHP and Overview of Node.js and React JS: Introduction, syntax, statements, operators, Loop stringfunctions, sessions, E-mail, Variables arrays in php with attributes Date & Time, Image uploading filehandling in php, PHP and MySQL, PHP and AJAX, introduction to node. js with mongo DB. React JS

Recommended Books / Suggested Readings:

1. HTML in 24 hours by SAMS publications
2. Programming PHP By Kevin Tatroe, Peter MacIntyre, RasmusLerdorf
3. Learning XML By Erik T. Ray
4. Head First Ajax By Rebecca Riordan
5. Head First JavaScript By Michael Morrison Fundamentals of Computer Algorithms, EllisHorowitz, SatrajSahni and Rajasekharam, Galgotia publications Pvt. Ltd
6. Beginning HTML, XHTML, CSS, and JavaScript By Jon Duckett
7. Php: The Complete Reference By Steven Holzner
8. Professional AJAX by Nicholas C Zakas

BCS 525: WEB TECHNOLOGIES LABORTARY

Credits: 1

LTP:0 0 1

Course Description: The course aims to equip the students with understanding and learn to implementation of HTML and to make student understand the basics of scripting using Java Script

The course enables the student to learn about XML, AJAX & real time query processing

Course Outcomes (CO):

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

CO1: Infer the structure of HTML elements in a webpage.

CO2: Build Webpages using HTML and CSS

CO3: Utilize JavaScript to add functionality to webpages

CO4: Implement different Ajax & JQuery functionalities in Web development.

List of experiments:

Students should be made to perform experiments learnt on the concepts of Computer Graphics covering the following list. They may perform more practical's as required to understand the subject.

1. Create web page in HTML to display the usage of formatting tags and lists
2. Create web page in HTML to display the usage of tables and frames
3. Show how to use graphics and links using HTML & CSS
4. Show the usage of image map and linking
5. Create alert, prompt and dialog box using JavaScript
6. Create a form using HTML and CSS. With the help of Javascript add all types of form validationsto it
7. Display the usage of Cookies using Javascript
8. Create an XML document
9. Create a form using AJAX
10. Create a formusing HTML, CSS, XML, AJAX and php and store & retrieve its data using MySQL
11. Create your own module in node.js and Program of jQuery selectors.

BCS604: COMPUTER GRAPHICS

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with mastering the principles of the art and science of computer graphics.

The course introduces the student to become proficient in the design and programming of interactive computer graphics systems and to understand in detail, the operation of a graphics pipeline and each of its components.

Course Outcomes (CO):

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

CO1: Identify and recognize the basic terminologies and concepts of Computer Graphics.

CO2: Understanding Elementary 3D graphics.

CO3: Evaluate various Algorithms of 2D Transformations on different type of objects.

CO4: Illustrate concepts of windowing and clipping and filling polygons.

CO5: Compare different color models, lighting, shading models for creating computer graphics applications.

Course Content

UNIT I

Introduction: Computer Graphics and its applications, Elements of a Graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input devices.

UNIT II

Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.

UNIT III

Two-dimensional Geometric Transformations: Basic Transformations-Translation, Rotation and Scaling, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing transformations.

UNIT IV

Clipping: viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping, text clippng.

UNIT V

Elementary 3D Graphics: Plane projections and its types, Vanishing points, Specification of a 3D view.Visibility: Image and object precision, Hidden edge/surface removal or visible edge/surface determination techniques; z buffer algorithms, Depth sort algorithm, Scan line algorithm and Floatinghorizon technique. Advance Topics: Introduction of Rendering, Ray tracing, Antialiasing, Fractals, Gourard and Phong shading, Color Models: Properties of Light, Intuitive Color Concepts, RGB Color Model, CMY Color Model, HLS and HSV Color Models, Conversion between RGB and CMY color Models, Conversion between HSV and RGB color models, Color Selection and Applications.

Recommended Books / Suggested Readings:

1. Donald Hearn and M. Pauline Baker, “Computer Graphics”, Second Edition, PHI/Pearson Education

2. Zhigandxiang, Roy Plastock, Schaum's outlines, "Computer Graphics Second Edition", Tata Mc-Grawhill edition
3. C, Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice", Second Edition,Pearson

BCS624: COMPUTER GRAPHICS LABORATRY

Credits: 1

LTP:0 0 1

Course Description: The course aims to equip the students with understanding and learn to master the principles of the art and science of computer graphics.

The course enables the student to become proficient in the design and programming of interactive andmultimedia systems and to understand in detail, the operation of a graphics pipeline and each of its components

Course Outcomes (CO):

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

CO1: Apply the various predefined functions for drawing various geometric shapes.

CO2: Implement various graphics algorithms for drawing and filling of geometric objects.

CO3: Analyze various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.

CO4: Compare strengths and weakness of various graphics algorithms.

List of experiments:

Students should be made to perform experiments learnt on the concepts of Computer Graphics covering the following list. They may perform more practical's as required to understand the subject.

1. Write a program to plot a point (pixel) on the screen
2. Write a program to draw a straight line using DDA Algorithm
3. Write a program to draw a straight line using Bresenham's Algorithm
4. Write a program to implement mid-point circle generating Algorithm
5. Write a program to implement ellipse generating Algorithm
6. Write a program to translate an object with translation parameters in X and Y directions
7. Write a program to scale an object with scaling factors along X and Y directions
8. Write a program to rotate an object with a certain angle about origin
9. Write a program to perform the rotation of an object with certain angle about an arbitrary point
10. Write a program to perform composite transformations of an object
11. Write a program to perform the reflection of an object about major
12. Write a program to clip line segments against windows using Cohen Sutherland Algorithm
13. Write a program to perform the polygon clipping against windows using Sutherland Hodgemantechnique
14. Write a program to fill a rectangle with a specified color using scan line algorithm
15. Write a program to implement flood-fill and boundary-fill algorithms.

SIXTH

SEMESTER

BCS651: ADVANCE JAVA PROGRAMMING

Credits: 3

LTP:3 0 0

Course Description: The course introduces the student to become proficient in the Web application based on Java uses Servlet, JSP, JSF. To store the data database connectivity and database JDBC component is needed. Networking components are needed to transfer data over network. Model-View-Controller (MVC) architecture gives flexibility and makes the web applications loosely coupled.

Course Outcomes (CO):

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

CO1: Implement Networking and Data base connectivity in Java for given application.

CO2: Implement webpage with dynamic content and server side web application using Servlet and JSP.

CO3: Use web application framework JSF to build user interfaces.

CO4: Use Object Relation Mapping using Hibernate to build database.

Course Content

UNIT I

Java Networking: Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URLConnection.

UNIT II

JDBC Programming: The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management.

UNIT III

Servlet API and Overview Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servelt, Request Dispacher interface, The Filter API: Filter, FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting

UNIT IV

Java Server Pages JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing

UNIT V

Hibernate 4.0: Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping,

Hibernate Annotation, Hibernate Query Language

Java Web Frameworks: Spring MVC Overview of Spring, Spring Architecture, bean life cycle, XML Configuration on Spring, Aspect – oriented Spring, Managing Database, Managing Transaction.

Recommended Books / Suggested Readings:

1. Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008.
2. Kathy walrath Complete Reference J2EE by James Keogh mcgraw publication
3. Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest Wiley Publication
4. SCWCD, Matthew Scarpino, Hanumant Deshmukh, Jignesh Malavie, Manning publication
5. Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication
6. Java Persistence with Hibernate by Christian Bauer, Gavin King
7. Spring in Action 3rd edition , Craig walls, Manning Publication
8. Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication
9. Java Server Faces in Action, Kito D. Mann, Manning Publication
10. JDBC™ API Tutorial and Reference, Third Edition, Maydene Fisher, Jon Ellis, Jonathan Bruce, Addison Wesley
11. Beginning JSP, JSF andTomcat, Giulio Zambon, Apress
12. JSF2.0 CookBook, Anghel Leonard, PACKT publication
13. Advanced Java, M. T. Savaliya, dreamtech

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BCS652: ADVANCE JAVA PROGRAMMING LABORATRY

Credits: 1

LTP:0 0 1

Course Description: This course provides the knowledge necessary to understand java and develop dynamic web pages using java server page (JSP). It covers the basic underlying concepts and techniques recently used in the IT industry. After going through this course student will be able to do Web Development and Desktop Application Development.

Course Outcomes (CO):

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

CO1: Develop Java Applet Programming using various techniques.

CO2: Develop applications using Abstract Window Toolkit.

CO3: Update and retrieve the data from the databases using JDBC-ODBC.

CO4: Develop server-side programs using Servlets.

CO5: Develop Java Server Pages applications using JSP Tags.

List of experiments:

1. Implement TCP Server for transferring files using Socket and ServerSocket.
2. Implement cookies to store firstname and lastname using Java server pages.
3. Implement the shopping cart for users for the online shopping. Apply the concept of session.
4. Implement student registration form with enrollment number, first name, last name, semester, contact number. Store the details in a database. Also implement search, delete and modify facility for student records.
5. Write a Servlet program to print system date and time.
6. Design a web page that takes the Username from the user and if it is a valid username prints “Welcome Username”. Use JSF to implement.
7. Write Hibernate application to store customer records and retrieve the customer record including name, contact number, address.
8. Write an application to keep records and retrieve records of student. The record includes student id, enrollment number, semester, SPI. Use MVC architecture.

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BCS601: COMPILER DESIGN

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with different stages in the process of compilation.

The course includes different methods of lexical analysis, top-down and bottom-up parsers, identify synthesized and inherited attributes, develop syntax directed translation schemes, develop algorithms to generate code for a target machine.

Course Outcomes (CO):

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

CO1: Discuss how the design of a compiler requires most of the knowledge acquired during their study.

CO2: Design top-down and bottom-up parsers for a given parser specification.

CO3: Apply the ideas, the techniques, and the knowledge acquired for the purpose of other language processor design.

CO4: Develop algorithms to generate code for a target machine.

Course Content

UNIT I

Introduction: Phases of compilation and overview.

Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

UNIT II

Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) gram-mars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottomup parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)

UNIT III

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree. Symbol Table: Its structure, symbol, attributes and management.

UNIT IV

Runtime Environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

Intermediate Code Generation: Translation of different language features, different types of intermediate forms.

UNIT V

Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc. **Architecture dependent code improvement:** instruction scheduling (for pipeline), loop optimization(for cache memory) etc. Register allocation and target code generation.

Advanced topics: Type systems, data abstraction, compilation of Object-Oriented features and non- imperative programming languages.

Recommended Books / Suggested Readings:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, “Compilers-Principles, Techniques & Tools”, Pearson Education
2. Robin Hunter, “Essence of Compilers”, Pearson Education

3. Steven S. Muchnick, Advanced Compiler Design & Implementation, Morgan Kaufmann Publishers

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BCS621: COMPILER DESIGN LABORATORY

Credits: 1

LTP:0 0 1

Course Description: The course aims to equip the students with basic compiler functioning.

The course includes different methods of lexical analysis, design top-down and bottom-up parsers, develop syntax directed translation schemes and develop algorithms to generate code for a target machine

Course Outcomes (CO):

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

CO1: Develop lexical analyzer for a given grammar specification

CO2: Design top-down and bottom-up parsers for a given parser specification

CO3: Develop syntax directed translation schemes

CO4: Apply algorithms to generate code for a target machine

List of Experiments:

1. C Program to Design Lexical Analyzer

2. Understanding the LEX/FLEX tool. Implementation of Lexical Analyzer using LEX/FLEX Tool.

3. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments,operators etc.)

4. Implementation of Predictive Parser in C language.

5. Understanding the YACC tool.

6. Generate YACC specification for a few syntactic categories.

a. Program to recognize a valid arithmetic expression that uses operator +, – , * and /.

b. Program to recognize a valid variable which starts with a letter followed by any number of lettersor digits.

c. Implementation of Calculator using LEX/FLEX and YACC

7. Convert the BNF rules into YACC form and write code to generate Abstract Syntax Tree.

8. Implement type checking.

9. Implement control flow analysis and Data flow Analysis.

10. Implement any one storage allocation strategies (Heap, Stack, Static)

11. Construction of DAG

12. Implement the back end of the compiler which takes the three-address code and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.

13. A Program to Generate Machine Code.

14. Implementation of Simple Code Optimization Techniques.

15. Design of a mini compiler for simple programs.

BCS603: **DESIGN AND ANALYSIS OF ALGORITHMS**

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with analyzing the asymptotic performance of algorithms. The course includes to write rigorous correctness proofs for algorithms, demonstrate a familiarity withmajor algorithms and data structures, apply important algorithmic design paradigms and methods of analysis and to synthesize efficient algorithms in common engineering design situations

Course Outcomes (CO):

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

CO1: Analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.

CO2: Describe the greedy paradigm and explain when an algorithmic design situation calls forit. For a given problem develop the greedy algorithms

CO3: Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrencerelation.

CO4: Describe the dynamic-programming paradigm and explain when an algorithmic designsituation calls for it. For a given problems of dynamic programming

CO5: Develop the dynamic programming algorithms and analyze it to determine itscomputational complexity.

CO6: Model engineering problem for a given model using graph and write the correspondingalgorithm to solve the problems.

Course Content

UNIT I

Introduction: Characteristics of algorithm.

Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Unit II

Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branchand- Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniquesfor Problem-Solving, Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

UNIT III

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT IV

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP,NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Recommended Books / Suggested Readings:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald LRivest and Clifford Stein, MIT Press/McGraw-Hill
2. Fundamentals of Algorithms – E. Horowitz et al
3. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson
4. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael TGoodrich and Roberto Tamassia, Wiley
5. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA

GNA UNIVERSITY
Inspiring Innovation.....

BCS623: DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

Credits: 1

LTP:2 0 0

Course Description: The course aims to equip the students with the implementation of variousalgorithms.

The course includes solving problems using divide and conquer strategy, backtracking strategy andgreedy and dynamic programming techniques.

Course Outcomes (CO):

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

CO1: Design algorithms using divide and conquer, greedy and dynamic programming.

CO2: Use the design techniques such as dynamic programming, greedy algorithm for more complex problems.

CO3: Analyze the performance of merge sort algorithms using divide and conquer technique.

CO4: Apply the dynamic programming technique to solve real world problems such as knapsack and TSP.

List of Experiments:

1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list tobe sorted and plot a graph of the time taken versus n. The elements can be read from a file or canbe generated using the random number generator.
2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements anddetermine the time required to sort the elements. Repeat the experiment for different values of n,the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3. Obtain the Topological ordering of vertices in a given digraph.
4. Compute the transitive closure of a given directed graph using Warshall's algorithm.
5. Implement 0/1 Knapsack problem using Dynamic Programming.
6. From a given vertex in a weighted connected graph, find shortest paths to other vertices usingDijkstra's algorithm.
7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
8. Print all the nodes reachable from a given starting node in a digraph using BFS method.
9. Check whether a given graph is connected or not using DFS method.
10. Find a subset of a given set S = {sl, s2,,sn} of n positive integers whose sum is equal to a given
11. positive integer d. For example, if S={1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.
12. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same
13. problem instance using any approximation algorithm and determine the errorin the approximation.

14. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

15. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.

16. Implement N Queen's problem using Back Tracking.

SEVENTH

SEMESTER

CS701: ARTIFICIAL INTELLIGENCE

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with various Artificial Intelligence Techniques and knowledgerepresentation methods.

The course includes knowledge acquisition, manipulation, various AI algorithms, Expert system and Natural LanguageProcessing.

Course Outcomes (CO):

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

CO1: Understand the basic concepts and techniques of Artificial Intelligence.

CO2: Apply AI algorithms for solving practical problems.

CO3: Describe human intelligence and AI.

CO4: Select appropriately from a range of techniques when implementing intelligent systems.

Course Content

UNIT I

Introduction and Applications: History of AI from Alan Turing and developments in AI, AItechniques, Criteria forsuccess. Problem Solving Concepts and Methods.

UNIT II

Problem Characteristics, Breadth -first Search and Depth-First Search methods, Heuristic Search Techniques - Hill Climbing, best first Search, A*, Problem reduction, Ao*, Constraint satisfaction andmeans-ends analysis techniques.

UNIT III

Information and Knowledge, Knowledge Acquisition and Manipulation, Issues in knowledge representation, Knowledge Representation Methods, Propositional Logic and First Order Predicate Logic, Resolution Principle, Horn's Clauses, Semantic networks, Partitioned Semantic Nets, Frames, Scripts and Conceptual Dependencies, Game playing: Minimax Search Procedure, Adding Alpha-BetaCutoffs

UNIT IV

Definition and Applications, Characteristics of Expert Systems, Architecture of a typical expert system, Expert system Shells, Building an Expert System, Knowledge Acquisition, Case studies of Expert Systems like MYCIN. Specific Application of AI.

UNIT V

Complexity of the problem, Syntactic processing, Semantic Analysis, Pragmatic processing, Introduction to Perception and Action.

Machine Learning: Clustering and Learning Basic Clustering Techniques, Standard k-Means (Lloyd) Algorithm, Generalized Clustering, Over partitioning, Merging, Modifications to the k-Means Algorithm, k-Means Wrappers, Rough kMeans, Fuzzy k-Means, k-Harmonic Means Algorithm, Hybrid Clustering Algorithms; Estimation using

Incomplete Data, Two classes, Multiple classes, Leastsquares for classification, Fisher's linear discriminant, Relation to least squares,Fisher's discriminantfor multiple classes

Recommended Books / Suggested Readings:

1. Rich Elaine and Knight Kevin,1991: Artificial Intelligence, second edition; Tata-McGraw HillCompany, New Delhi
2. Russel, Sturat & Norviig, Peter, 2007: Artificial Intelligence; a modern Approach published byPerson Education(Singapore)Pvt. Ltd.
3. George F Luger; William A. Stubblefield, 2009: Artificial Intelligence; Structures and Strategiesfor Complex problem solving, Second edition
4. Balaguruswami, 1994: Artifical Intelligence & Technology.
5. Bharti & Chaitany, 2005: Natural Language Processing, PHI. 8. Patterson, Dan W., 1995.: Introduction to ArtificialIntelligence and Expert Systems, Prentice-Hall of India Pvt.Ltd., New Delhi.

BCS712: ARTIFICIAL INTELLIGENCE LABORATORY

Credits: 1

LTP:0 0 2

Course Description:

The course aims to equip the students with the basic concepts of how to use various AI techniques. This course includes various techniques and algorithms of AI used in general problem solving, optimization problems, constraint satisfaction problems, and game programming.

Course Outcomes (CO):

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

CO1: Explain artificial intelligence, its characteristics and its application areas.)

CO2: Formulate real-world problems such as state space problems, optimization problems or constraint satisfactionproblems.

CO3: Select and apply appropriate algorithms and AI techniques to solve complex problems.

CO4: Design and develop an expert system by using appropriate tools and techniques.

List of Experiments:

1. Defining AI; Turing's test; Weak vs. Strong AI.
2. Applications of AI; Agent based approach.
3. State space search: DFS, BFS, IDS algorithms
4. Informed search: A* algorithm
5. Optimization problems & Local search algorithms
6. Genetic algorithms
7. Constraint satisfaction problems
8. Expert systems
9. Game playing (adversarial search)
10. Introduction to machine learning.

BCS942: COMPUTER VISION

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with fundamental problems of computer vision. The course includes computer vision fundamentals, model fitting, Model reconstruction and Object recognition and shaperepresentation.

Course Outcomes (CO):

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

CO1: Understand the fundamental concepts in computer vision.

CO2: Evaluate solutions to problems in computer vision.

CO3: Demonstrate awareness of the current key research issues in computer vision.

CO4: Analyze and design a range of algorithms for image processing and computer vision.

Course Content

UNIT I

Introduction: overview of computer vision, related areas, and applications; overview of software tools; overview of courseobjectives.; introduction to OpenCV. Image formation and representation: imaging geometry, radiometry, digitization, cameras and projections, rigid and affine transformations. Filtering: convolution, smoothing, differencing, and scale space. Feature detection: edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors,shape context descriptors.

UNIT II

Model fitting: Hough transform, line fitting, ellipse and conic sections fitting, algebraic and Euclidean distance measures. Camera calibration: camera models; intrinsic and extrinsic parameters; radial lens distortion; direct parameter calibration;camera parameters from projection matrices; orthographic, weak perspective, affine, and perspective camera models. Peripolar geometry: introduction to projective geometry; epipolar constraints; the essential and fundamental matrices; estimation of the essential/fundamental matrix.

UNIT III

Model reconstruction: reconstruction by triangulation; Euclidean reconstruction; affine and projective reconstruction. Motion analysis: the motion field of rigid objects; motion parallax; optical flow, the image brightness constancy equation, affine flow; differential techniques; feature-based techniques; regularization and robust estimation; motion segmentationthrough Emotion tracking: statistical filtering; iterated estimation; observability and linear systems; the Kalman filter; the extended Kalman filter

UNIT IV

Object recognition and shape representation: alignment, appearance-based methods, invariants, image eigenspaces, data-based techniques. Final presentation: students present selected topics and develop software implementation of relatedtechniques based on the review of relevant literature. The work should be summarized in concluding report which shouldinclude simulation results. A list of possible topics will be advertised prior to the

project selection due date.

Recommended Books / Suggested Readings:

1. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
2. Computer Vision: A Modern Approach, D. Forsyth and J. Ponce, Prentice Hall, 2nd ed., 2011.
   Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998

BCS932: COMPUTER VISION LABORATORY

Credits: 1

LTP:0 0 1

Course Description:

This lab equips learner with knowledge in how computers see and interpret the world as humans do;core concepts of Computer Vision and human vision capabilities; key application areas of ComputerVision and Digital Image Processing; Machine Learning and AI basics; and more.

Course Outcomes (CO):

CO1. Implement basic knowledge, theories and methods in image processing and computer vision.

CO2.Identify, formulate and solve problems in image processing and computer vision.

CO3.Analyze, evaluate and examine existing practical computer vision systems.

List of Experiments:

1. Windows and Plots
2. Program to change the Brightness of Image
3. To Flip the image around the vertical and horizontal line
4. Display the color components of the image Red Green Blue Components of Image
5. To find the negative of an image
6. Calculate the Histogram of a given image
7. Histogram Equalization of an image.
8. Program for Image Filtering (low pass filter)1) Average filter2) Weighted Average filter3) Medianfilter High pass filters using1) Sobel operator2) Laplacian operator
9. Edge detection with gradient and convolution of an Image
10. Program to find threshold of grayscale image.
11. Program to find threshold of RGB image.
12. Program to estimate and subtract the background of an image.
13. Program to convert color image to gray and HSV
14. Mini Project.

BTCC711: DEVOPS Laboratory

Credits: 1

LTP:0 0 1

Course Description:

This Lab course makes student learn the fundamental principles and practices associated with DeVops. To apply the principles and practices of DevOps and automation on a project of interest and relevance to the student.

Course Outcomes (CO):

CO1: Identify components of Devops environment

CO2: Apply different project management, integration, testing and code deployment tool

CO3: Investigate different DevOps Software development, models

CO4: Demonstrate continuous integration and development using Jenkins.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in
4. exercise 1.
5. Jenkins installation and setup, explore the environment.
6. Demonstrate continuous integration and development using Jenkins.
7. Explore Docker commands for content management.
8. Develop a simple containerized application using Docker.
9. Integrate Kubernetes and Docker
10. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
11. Install and Explore Selenium for automated testing.
12. Write a simple program in JavaScript and perform testing using Selenium.
13. Develop test cases for the above containerized application using selenium.

ELECTIVES

(ELECTIVE – I)

BTFS301 Basics of Front-End Development

LTP:3 0 0

Course Description: This course is designed to provide students with a solid foundation in the front-end web development fundamentals.

Course Outcomes: Through this course, students should be able to

CO1: Understand advanced JavaScript concepts.

CO2: Develop JSX components and use props in the React app.

CO3: Compose and manipulate states and develop an understanding of events and hooks.

CO4: Use forms with state and validate the form for errors and display errors.

CO5: Make a react app by using HTTP methods and routing the pages.

Unit I

Refreshing JavaScript, ES6 Refresher: Classes, Arrow Functions, Variables (let, const, var), Array Methods like map ( ), Destructuring, Spread Operator, Modules Introduction to SPA, MPA, and React framework: best practices of front-end development Understanding Single Page Applications (SPAs) and Multi-Page Applications (MPAs) Real-World SPAs & React Web Apps Introduction to the React framework Features of React, Advantages and Disadvantages of React

Unit II

React JS Installation and Basics: Installing React using Create React App, React Environment and Folder Structure, JSX (JavaScript XML) in React, Understanding Component Basics, JSX introduction createElement() arguments, JSX vs React.createElement() method, JSX expressions, Rendering Elements into the DOM, Components, and styles in React, Creating components, Class components and Function components, Functional Components, React Virtual DOM Props (Properties) CSS in React: Inline styling, CSS stylesheets, CSS Modules Adding Bootstrap to React projects, Working with class component,

Unit III

Understanding Hooks and Component Lifecycle, Hooks basics, Built-in hooks: useState, useEffect, useContext, useRef, useReducer, useCallback, useMemo Custom hooks, Event handling in React, Stateless and Stateful Components, Creating State, Common pitfalls of state management, Component Lifecycle

Unit IV

Working with ReactRouterDOM and Template Design Slice, Master Page Concept in Design, Working with Forms, Adding forms to React applications, Handling form submissions, Controlled and uncontrolled components, Forms validation: error checking and displaying errors

Unit V

Introduction to Postman, installation and usage(Collection and API), Working with REST API, HTTP Methods and

Routing, Fetch() and Axios for making HTTP requests, GET Requests, POST Requests, PUT Requests, DELETE Actions, Setting up routing and routes in React, Navigating to pages, Navigating back and forward, Passing data via Query Params, Passing data between pages, Fetching data from APIs, File uploading and Handling Form-data(multipart data handling).

Unit VI

Redux and Debugging/Deployment, Redux basics, App starting point for Redux, Understanding the Redux flow: Store and Reducer, Connecting Components with Redux, dispatching actions, Debugging the React App, Building the app for production, best practices for the build and deployment process, Progressive web app concepts and consideration

Recommended Books / Suggested Readings:

1. Developing A React.Js Edge, 2ed: The Javascript Library for User Interfaces by Richard Feldman, Frankie Bagnardi, Simon Hojberg, Wiley
2. Learning React: A Hands-On Guide to Building Web Applications Using React and Redux Kindle Edition by Kirupa Chinnathambi, Addison-Wesley Professional
3. Beginning React with Hooks Bu Greg Lim, Kindle Edition, Createspace Independent Publishing Platform.

BTCC101: INTRODUCTION TO CLOUD COMPUTING

Credits: 3

LTP: 3 0 0

Course Description:

The purpose of this course is for students to grasp the hardware, software ideas, and architecture of cloud computing. Students understand the significance of Cloud Virtualization, Abstractions, and Enabling Technologies. This course includes fundamentals of cloud computing, Virtualization, Cloud Deployment Scenarios Security in Cloud Computing.

Course Outcomes:

Upon successful completion of this course students should be able to:

CO1: Compare cloud computing systems, their relative merits and suitability of each for complex data-intensive applications.

CO2: Explain and characterize different cloud computing models, namely, infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS)

CO3: Implement security in cloud computing.

CO4: Compare, contrast, and evaluate the key trade-offs between multiple approaches to cloud system design.

CO5: Identify appropriate design choices when solving real-world cloud computing problems.

CO6: Write comprehensive case studies analyzing and contrasting different cloud computing.

solutions

Contents:

UNIT I

Introduction to Cloud Computing: Concepts of cloud and data center, Advantages of Cloud, Necessity of using Cloud, driving factors towards Cloud, Comparing grid with cloud and other computing systems. Networking Basics: Introduction: Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model, Comparison of the OSI and TCP/IP reference model. Architecture of Internet.IPV4 and IPV6 protocols.

UNIT II

Cloud Computing Virtualization: Cloud computing leverages the Internet, Elasticity and scalability,Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Management, tooling and automation in cloud computing, Management: Desktops in the Cloud, Security in Cloud Computing, IBM cloud computing architecture, Introduction to Service Management

UNIT III

Cloud Service Delivery: Cloud service, Cloud service model architectures, Infrastructure as a service(IaaS), Platform as a Service (PaaS), Software as a service (SaaS), Examples of IaaS, PaaS, SaaS applications, Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform, Customer Project Experiences &How to implement Cloud services.

UNIT IV

Cloud Deployment Scenarios: Cloud deployment models, public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud Deployment, Disruptive Network Trends

UNIT V

Security in Cloud Computing: Cloud security reference model, Cloud security, understanding security risks, Principal security dangers to cloud computing, Virtualization and multitenancy, Internalsecurity breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Amazon Web Services, Google Cloud platform, Windows Azure platform, a comparison of Cloud Computing Platforms

Recommended Books / Suggested Readings:

1. Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski, Cloud Computing: Principles and paradigms, 2011
2. Michael Miller, Cloud Computing, 2008.
3. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies,2009.
4. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud Computing: A practical Approach, McGraw Hill, 2010.
5. Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
6. BorkoFurht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer, 2010.

BTCY301: FUNDAMENTALS OF CYBER AND NETWORK SECURITY

Credits: 1

LTP:0 0 2

Course Description:

This course provides the foundation for understanding the key issues associated with protecting information assets. The purpose of the course is to provide the student with an overview of the field ofinformation security and assurance

Course Outcomes (CO):

This course will develop students 'knowledge in/on…

CO1: Analyze the broad set of technical, social & political aspects of Cyber Security.

CO2: Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure.

CO3: Describe the importance of ethical hacking tool.

CO4: Implement the ethical hacking process.

Course Content:

UNIT I

INTRODUCTION TO CYBER SECURITY - Importance and challenges in Cyber Security - Cyberspace- Cyber threats - Cyber warfare - CIA Triad - Cyber Terrorism – Cyber Securityof CriticalInfrastructure -Cyber security –Organizational Implications.

UNIT II

HACKERS AND CYBERCRIMES: Types of Hackers- Hackers and Crackers, Profile, Malicious Software: Viruses, Worms, System Corruption, Attack Agents, Information Theft, Keyloggers, Phishing, Spyware Payload Stealthing, Backdoors, Rootkits, Distributed Denial of Service Attacks, Bots and Botnets.

UNIT III

ETHICAL HACKING AND SOCIAL ENGINEERING: Ethical Hacking Concepts and Scopes - Threats and Attack Vectors - Information Assurance – Threat Modeling-Enterprise Information Security Architecture- Vulnerability Assessment and Penetration, Testing-Types of Social Engineering-Insider Attack- Preventing Insider Threats-SocialEngineering Targets and Defense Strategies.

UNIT IV

NETWORK SECURITY: IP Security Overview, IP Security Policy, IPV4, IPV6, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange (IKE), DHCP, NAT, DNS, FQDN, IoT.

UNIT V

CRYPTOGRAPHY: Basic of cryptography, including conventional and public-key cryptography, hash functions, authentication, and digital signatures. Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure, certificate Authority (CA), SSH and SSL

Recommended Books / Suggested Readings:

1. Donaldson,S.,Siegel,S.,Williams,C.K.,Aslam,A.,"EnterpriseCybersecurity –How to
2. Build a Successful Cyber defense Program against Advanced Threats", Apress, 1st Edition, 2015.
3. Nina Godbole, Sumit Belapure, "CyberSecurity", Willey, 2011.
4. Roger Grimes,"Hacking the Hacker", Wiley, Ist Edition,2017.
5. Cyber Law By Bare Act, Govt of India, IT Act 2000

BTBD101: Introduction to Artificial Intelligence
Credits 3
LTP:3 0 0

Course Description:
The course "Introduction to Artificial Intelligence " is designed to provide students with a comprehensive foundation in two crucial domains: Artificial Intelligence (AI) and Machine Learning.

Course Outcomes (CO):

Upon successful completion of this course students should be able to:

CO1: Understand of the fundamental concepts and terminology of Artificial Intelligence.

CO2: Discuss tools and program paradigms of AI.

CO3: Identify real-world applications of AI across various industries.

CO4: Describe the fundamentals of Machine Learning.

Course Content:

UNIT – I

Introduction: Introduction to AI, Introduction to data, Data collection and API's, Data preprocessing, Data analysis, Predictive modelling, Applications of AI in Decision making.

UNIT – II

Tools used for AI: Programming Languages – Python & R, Visualization tools – Power BI & Tableau, Python libraries – Numpy, Pandas, Matplotlib & Sci-kit learn.

UNIT –III

Various types of AI & its applications: Types: Machine Learning, Deep Learning, Image Processing, Natural Language Processing, Video Analysis. Applications: Sentiment Analysis, Attendance systems, Chatbots, Sales & Demand forecasting, Customer & employee churn analysis.

UNIT – IV

Python libraries for Data Analysis: Numerical data handling types, Introduction to numpy arrays, data transformation with numpy, introduction to pandas dataframes, data selection & manipulation, visuals & plots with matplotlib, plotting data from pandas dataframes.

UNIT – V

Overview of Machine Learning: Introduction to Machine Learning, types of ML, supervised & unsupervised learning, implementing algorithms with scikit-learn, overview of various ML algorithms.

Recommended Books / Suggested Readings:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall,
2. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer
3. Science)", Jones and Bartlett Publishers, Inc.; 1st Edition, 2008.
4. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press,2009.
5. Python GUI programming Cookbook -Burkahard A Meier, Pack Publication, 2nd Edition.
6. Barry, P. (2016). Headfirst Python: A brain-friendly guide. "O'Reilly Media,
7. Inc.". Lutz, M. (2013). Learning python: Powerful object-oriented programming. "O'Reilly Media, Inc.".

ELECTIVE-II

BTFS401: Back-End Development Using PHP and MySQL

Credits: 3

LTP:3 0 0

Course Description: This course is aimed at providing a fundamental understanding of dynamic web site creation. PHP is the language used for development of most common web sites. Syllabus includes basic and advanced features of PHP which includes detailed introduction of PHP and MYSQL, Arrays, Loops and variables etc. It also gives an overview open-source framework like JOOMLA, ZEND etc.

Course Outcomes (CO):

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

CO1: Implement PHP script using Decisions and Loops.

CO2: Create PHP scripts that: use object-oriented PHP.

CO3: Design web applications using session and cookies, frameworks.

CO4: Use PHP to retrieve data from the MySQL database and display it in various formats including tables.

Course Content

UNIT I

Introduction to Open Source and PHP programming: Introduction to Open Sources Technologies, Introduction to PHP, installation and configuration, Advantages and Disadvantages of PHP, Client-Side Scripting, Server-Side Scripting, Variables, data types, various types of function, creating your own function, Strings in PHP, String Functions.

UNIT II

Operator, Loops, Array, Exception and Error Handling: Operators, Conditions, Loops, using for each, Creating and Using Arrays, Multidimensional Array, Associative Array. Error Handling in PHP, Errors and Exceptions, Exception class, try/catch block, throwing an exception, defining your own Exception subclass.

UNIT III

Classes, File system, Passing Information between pages: Object oriented programming with PHP, Working with Datetime, code re-use, require (), include (), and include path; Understanding PHP file permissions, File reading and writing functions, File system functions, File uploads, Sending mail & use of email server. HTTP, GET arguments, POST arguments, Using Session in PHP, cookies, The setcookie() function, Deleting Cookies and Reading Cookies.

UNIT IV

Working with database: HTML Tables and Database tables, Database manipulation (Select, Insert, Update, Delete), validating User Input using JavaScript. MYSQL, Introducing MySQL; database design concepts; the Structured Query Language (SQL); communicating with a MySQL backend via the PHP, MySQL API Building

Database Applications, Developing PHP scripts for dynamic web page like feedback form, online admission form and online test.

Working with Frameworks: Working with Mambo, working with Joomla, Working with framework. Working with WordPress, Working with Drupal, Use of Joomla in rapid development of website.

Recommended Books / Suggested Readings:

1. Beginning PHP, Apache, MySQL Web Development, Michael K. Glass, Yann Le Scouarnec, Elizabeth Naramore, Gary Mailer, Jeremy Stolz, Jason Gerner, published by Wiley, wrox.
2. PHP, MySQL and Apache Julie C Meloni Pearson Education ISBN : 81-297-0443-9.
3. The Complete Reference PHP, by Steven Holzner, Tata McGraw-Hill Publication.
4. Beginning PHP and MYSQL, by W. Jason Gilmore, Apress Publication.

BTFS421: Back-End Development Using PHP and MySQL LABORATORY

Credits: 1

LTP:0 0 2

Course Description:

This lab equips learner with knowledge to develop required skills in the students so that they are able to acquire following competency in develop interactive web-based application using PHP and MySQL.

Course Outcomes (CO):

CO1: Create small programs using basic PHP concepts.

CO2: Design and develop a Web site using form controls for presenting web-based content.

CO3: Debug the Programmes by applying concepts and error handling techniques of PHP.

CO4: Create dynamic Website/ Web based Applications, using PHP, MySQL database.

List of Experiments:

1. Write the process of installation of web server.
2. Write programs to print all details of your php server. Use phpinfo().
3. Write a program to give demo of ECHO and PRINT command.
4. Write a program to implement the string functions.
5. Write a program to print Fibonacci series upto a given number using recursion.
6. Write a menu driven program to implement a calculator which performs only addition, subtraction, multiplication and division. The operation should happen based on user choice.
7. Write a program sort ten number by using array.
8. Write a program to demonstrate the concept of associative array.
9. Write a program to demonstrate the concept of multidimensional array.
10. Write a program to demonstrate the concept of Classes & objects.
11. Create a login form with two text fields called “login” and “password”. When user enters “GNA”as a user name and “university” as a password it should be redirected to a Welcome.HTML page or toSorry.HTML in case of wrong username/password.
12. How to work with sessions in PHP?
13. Introduction to Mysql creating databases, tables, using command line and gui interface, phpmyadmin
14. How to connect to MySQL using PHP ? Write programs for insertion, deletion updates and other sql queries. Design front end using html, css and write php scripts for processing of data. Try all different methods of connecting from php to MySQL.
15. Make a small project with mysql and php to perform CRUD operations.
16. Use Session also. Create a form with a text box asking to enter your favorite city with a submit button when the user enters the city and clicks the submit button another php page should be open displaying “Welcome to the city”.

17. Write a program to design login form in which find the greatest number amongst three numbers.
18. WAP for Marksheet generation.
19. Design a webpage for entering the student details with all the validations applied on it.
20. Write a php script to print current date and time.
21. Write a pp script to use include and require functions.
22. Write a php script including all the file handling functions.
23. Design a website using Wordpress /Joomla/Drupal
24. Introduction to Laravel frame work and one simple project

BCS542: LINUX AND SHELL PROGRAMMING

Credits: 3

LTP:3 0 0

Course Description: This course explains the fundamental ideas behind the open-source operating system approach toprogramming. Knowledge of Linux helps to understand OS level programming.Like the successful computer languages that came before, Linux is the blend of the best elements of itsrich heritage combined with the innovative concepts required by its unique environment. This courseinvolves kernel concepts, basics commands, shell scripting, file processing, Socket programming, Processes, Inter process communication.

Course Outcomes (CO):

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

CO1: Use various Linux commands that are used to manipulate system operations at adminlevel and a prerequisite topursue job as a Network administrator.

CO2.: Write Shell Programming using Linux commands.

CO3: Design and write application to manipulate internal kernel level Linux File System.

CO4: Develop IPC-API's that can be used to control various processes for synchronization.

CO5: Develop Network Programming that allows applications to make efficient use of resources available on different machines in a network.

Course Content

Introduction to Linux and Linux Utilities: A brief history of LINUX, architecture of LINUX, features of LINUX,

introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir,rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio

UNIT II

Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters: Filters and Pipes,Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT III

UNIX File Structure: Introduction to UNIX file system, inode (Index Node), file descriptors, system calls and devicedrivers.

GREP: Operation, grep Family, Searching for File Content. Sed: S c r i p t s , Operation, Addresses, commands,Applications, grep and sed.

File Management: File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink,unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

UNIT IV

PROCESS AND SIGNALS: Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling, starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork,exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

UNIT V

Inter Process Communication: Pipe, process pipes, the pipe call, parent and child processes,and named pipes: fifos, semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv,msgctl, shared memory: shmget, shmat,shmdt, shmctl, ipc status commands.

INTRODUCTION TO SOCKETS: Socket, socket connections - socket attributes, socket addresses, socket, connect, bind,listen, accept, socket communications.

Recommended Books / Suggested Readings:

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX Network Programming, W.R. Stevens, PHI. UNIX for Programmers and Users, 3rd Edition,Graham Glass,King Ables, Pearson Education

BCS524: LINUX AND SHELL PROGRAMMING LABORATORY

Credits: 1

LTP:0 0 2

Course Description:

The course aims to equip the students with basic UNIX/Linux commands from the command line (froma terminal window) and to know how to use UNIX/Linux resources to find additional information about UNIX/Linux command The course introduces the student to be knowledgeable enough about basic UNIX/Linux shell scripting to be able to successfully read and write bash shell scripts

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:CO1:
Use command substitution to capture program output.
CO2: Use conditional statements to control the execution of shell scripts. CO3:
Write shell scripts to perform repetitive tasks using while and for loops.CO4:
Design and implement shell functions.
CO5: Customize their UNIX/Linux working environment
CO6: Identify and process command-line arguments.

List of experiments:

1. Experiment 1 (Basic commands)
   - I. Installation of Unix/Linux operating system.
   - II. Study of logging/logout details.
   - III. Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands.
   - IV. Study of vi editor
   - V. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
   - VI. Study of Unix/Linux file system (tree structure).
   - VII. Study of. bashrc, /etc/bashrc and Environment variables.
2. Experiment 2 (Shell scripts)
   - I. Write a shell script program to display list of user currently logged in.
   - II. Write a shell script program to display “HELLO WORLD”.
   - III. Write a shell script program to develop a scientific calculator.
   - IV. Write a shell Script program to check whether the given number is even or odd.
   - V. Shell script Program to search whether element is present is in the list or not.
3. Experiment 3 (Shell scripts and sed)
   - I. Shell script program to check whether given file is a directory or not.
   - II. Shell script program to count number of files in a Directory.

III. Shell script program to copy contents of one file to another.

IV. Create directory, write contents on that and Copy to a suitable location in your home directory.

V. Use a pipeline and command substitution to set the length of a line in file to a variable.

VI. Write a program using sed command to print duplicated lines of Input.

4. Experiment 4 (grep, awk, perl scripts)

I. Write a grep/egrep script to find the number of words character, words and lines in a file.

II. Write an awk script to develop a Fibonacci series.

III. Write a perl script to compute the power of a given number.

IV. Write an awk script to display the pattern of given string or number.

V. Write a perl script to check a number is prime or not.

VI. Write an egrep script to display list of files in the directory.

5. Experiment 5 (programming)

I. Write a shell script program to display the process attributes.

II. Write a shell script to change the priority of processes.

III. Write a shell script to change the ownership of processes.

IV. Write a program to send back a process from foreground.

V. Write a program to retrieve a process from background.

VI. Write a program to create a Zombie process.

VII. Write a program to create a child process and allow the parent to display “parent” and the child todisplay “child” on the screen.

6. Experiment 6 (Shell script programming)

I. Write a shell script program to check variable attributes of file and processes.

II. Write a shell script program to check and list attributes of processes.

III. Shell Script program to implement read, write, and execute permissions.

IV. Shell Script program for changing process priority.

V. Shell Script program to create Chess Box

BTBD401: Machine Learning and Applications
Credits: 3
LTP:3 0 0

The course is to provide basic understanding of the concepts of machine learning. The course is to introduce the students withconcepts of machine learning, machine learning algorithms and building the applications using machine leaning for various domains.

Course Outcomes (CLO):

Upon successful completion of the course, the students should be able to:
CO1: Demonstrate knowledge of learning algorithms and concept learning through implementation for sustainablesolutions of applications.
CO2: Understand a wide variety of learning algorithms.
CO3: Implement the common artificial neural network and Bayesian Learning.
CO4: Implement various machine learning algorithms in a range of real-world applications.

Course Content

Unit I

Introduction: What is Machine Learning, Examples of Machine Learning applications, Training versus Testing, Positiveand Negative Class, Cross-validation. Types of Learning: Supervised, Unsupervised and Semi-Supervised Learning. Dimensionality Reduction: Introduction to Dimensionality Reduction, Subset Selection, Introduction to Principal Component Analysis.

Unit II

Classification: Binary and Multiclass Classification: Assessing Classification Performance, Handling more than two classes, Multiclass Classification-One vs One, One vs Rest Linear Models: Perceptron, Support Vector Machines (SVM),Soft Margin SVM, Kernel methods for non-linearity.
Regression and Generalization: Regression: Assessing performance of Regression – Error measures, Overfitting and Underfitting, Catalysts for Overfitting, VC Dimensions Linear Models: Least Square method, Univariate Regression, Multivariate Linear Regression, Training and Testing

Unit III

Artificial Neural Networks: Introduction, Natural Network Representations, Appropriate Problems for Neural NetworkLearning, Perceptions, Multilayer Network and the BACKPROPAGATION Algorithm.
Bayesian Learning: Introduction, Bayes Theorem, Native Bayes Classifier.

Unit-IV

Applications of machine learning in natural language processing: Backpropagation through time,long short-term memory, attention networks, memory networks, question answering, speech recognition, Genetic Algorithm.

Recommended Books / Suggested Readings:

1. Machine Learning, Saikat Dull, S. Chjandramouli, Das, Pearson.
2. Machine Learning with Python for Everyone, Mark Fenner, Pearson.
3. David Longbow, “Machine Learning: A Beginners Guide to the Fundamentals of Machine Learning”, PaperbacK.
4. Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph, Wiley
5. Machine Learning with Python, U Dinesh Kumar Manaranjan Pradhan, Wiley
6. Python Machine Learning, Sebastian Raschka, Vahid Mirjalili, Packt Publishing.
7. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press 2012.
8. Ian Goodfellow, Yoshua Bengio and Aaron Courville. Deep Learning. MIT Press 2016.
9. Bayesian Reasoning and Machine Learning David Barber, Cambridge University Press, 2012

BTBD421: Machine Learning and Applications Laboratory

Credits: 1

LTP: 002

Course Description:

This course will help students to build up core competencies in understanding machine learning approaches and studentswill be able to design and train machine learning modes for various use cases.

Course Outcomes (CLO):

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

CO1: Understand the need of machine learning for various problem solving.

CO2: Prepare machine leaning model and learning the evaluation methods.

CO3: Evaluate various supervised learning algorithms using appropriate dataset.

CO4: Evaluate various unsupervised learning algorithms using appropriate dataset.

CO5: Understand the use of various existing machine learning libraries.

List of experiments:

1. Implement data pre-processing
2. Deploy Simple Linear Regression
3. Simulate Multiple Linear Regression
4. Implement Decision Tree
5. Deploy Random Forest classification
6. Simulate Naïve Bayes algorithm
7. Implement K-Nearest Neighbors (K-NN), k-Means
8. Deploy Support Vector Machine, Apriori algorithm
9. Simulate Artificial Neural Network
10. Implement the Genetic Algorithm codeSuggested Tools Python/R/MATLAB

ELECTIVE – III

BTFS501: REACT/NODE JS

Credits: 3

LTP: 300

Course Description:

The course equips the learner for developing a single-page or mobile applications and creates reusable components for web pages and mobile applications. This course includes technologies of the React/Node JS framework.

Course Outcomes (CLO):

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

CO1: Describe the technologies of the React/Node JS framework.

CO2: Develop application development in React/Node JS.

CO3: Discuss the concept of database using Mongo DB and connect database with application.

CO4: Design and implement full featured web application using the concepts of Node JS

Course Content

Unit I

React fundamentals: TypeScript by setting up a development environment, introducing them to the TypeScript programminglanguage and the React framework, and demonstrates some of the basic concepts that underpin the use of React for building dynamic reactive user interfaces.

Unit II

State management: Hooks feature of React, on the usage of callback functions and how to use them to build dynamiccomponents that maintain an internal state, state management by building a form and accepting user input**.**

Unit III

Introduction: Node JS Setup, Node JS Environment, Package Manager, Features, Console Object, Concept of Callbacks.

Unit-IV

Node JS in details: Events and Event Loop, timers, Error Handling, Buffers, Streams, Work with File System, Networking with Node (TCP, UDP and HTTP clients and servers), Web Module, Debugging, Node JS REST API, Sessions and Cookies, Design patterns, caching, scalability.

Unit-V

Database Programming with Node JS and MongoDB: Basics of MongoDB, Data types, Connect Node JS with MongoDB,Operations on data (Insert, Find, Query, Sort, Delete, Update) using Node JS.

Recommended Books / Suggested Readings:

1 Node.js in Action ISBN 9789386052049 Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J.Holowaychuk, Nathan Rajlich, Wiley Publication.

2 Node.Js in Practice ISBN 9789351197744 Alex Young, Marc Harter, Ben Noordhuis Wiley Publication

3 Pro AngularJS Freeman Apress publication.

Professional Node.js By Pedro Teixeira 9781118240564 Wiley Packt Publishing.

Cloud Computing Tools
Credits: 3
LTP 300

Course Description: The course aims to equip the students with the tools of AWS Cloud. The course includes the Linux and Shell commands, AWS Cloud Services, Usage of Git and Git Hub to develop and deploy cloud services and to administer them.

Course Outcomes (CO):
Upon successful completion of the course, the students should be able to:
CO1: Administrate and architect the various Cloud Services
CO2: Use Git and Git hub for cloud application.
CO3: Deploy virtual machines, databases and memory systems
CO4: Automate the AWS Cloud environment
Course Content:

UNIT 1

Linux - Linux File Hierarchy Structure, Basic Linux Commands Practice like pwd, touch, vi/vim/nano cp mv mkdir, etc, Essentials of Advance Linux Commands, User, Group and File Permissions Management, Linux Package Management, System Monitoring & Cron Scheduling, Backup/Sync Files and Directories in Linux, Linux Archiving/Compression, Backup/Sync and Recovery, Manage Services in Linux, Apache Server, Linux System Security and Firewall, Basic Shell Scripting. Virtualization

UNIT II

Git & GitHub – Basic Git Bash commands, GitHub – Creating repository, clone, fork repository, Pull/push request, Branching, ReadMe file, Importance of ReadMe file, Advance Git Bash Commands.

UNIT III

AWS – Introduction to EC2, EC2 deployment, S3, S3 versioning, AWS Lambda, AWS IAM, Federating Users, ECS, RDS, Docker, major Components of Docker, Installing Docker, Docker images and containers, Container management, Docker Hub, Docker images, Docker swarm, Docker engine, Docker Networking.

UNIT IV

Automation - Tagging, use of tags, Connecting Networks, site-to-site VPN, AWS Direct Connect, VPC peering, Scaling VPC, AWS Transit Gateway, Automate the Architecture – AWS CloudFormation Template, Automating Deployments – AWS Elastic Beanstalk, Microservices Applications, Microservices with AWS Containers, Serverless Architecture with AWS Lambda and API Gateway, Introduction to Kubernetes, Kubernetes architecture, Deployment and pods, service and ingress. Introduction to Jenkins and Terraform.

Suggested Books:

1. Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles
2. and paradigms, 2011
3. Michael Miller, Cloud Computing, 2008.
4. Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for
5. dummies, 2009.
6. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud Computing: A practical
7. Approach, McGraw Hill, 2010.
8. Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
9. Borko Furht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer, 2010
10. AWS Online Resources and AWS Academy Material

BTCY527: CLOUD COMPUTING TOOLS LABORATORY

Credits: 1

LTP:0 0 2

COURSE Description:

This course gives students an insight into the basics of cloud computing tools, cloud computing is one of the fastest growing domains from a while now. It will provide the students basic understanding about cloud tools.

COURSE OUTCOMES:

At the end of this course students will be able to:

CO1: Configure various virtualization tools such as Virtual Box, VMware workstation.

CO2: Design and deploy a web application in a PaaS environment.

CO3: Discuss how to simulate a cloud environment to implement new schedulers.

CO4: Use a generic cloud environment that can be used as a private cloud.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top ofwindows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applicationsusing python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not presentin CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).
8. VMWare Simulator

BTCY501: CRYPTOGRAPHY

Credits: 3

LTP: 300

Course Description

To highlight the features of different technologies involved in Network Security and learn various crypto systems. This course includes Security trends, mathematics of asymmetric and symmetric cryptography **and** message authentication andintegrity.

COURSE OUTCOMES:

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

CO1: Understand basic cryptographic algorithms, message and web authentication and security issues.

CO2: Apply the different cryptographic operations of public key cryptography symmetric cryptographic algorithms

CO3: Apply the various authentication schemes to simulate different applications.

CO4: Identify information system requirements for both of them such as client and server.

CO5: Understand the current legal issues towards information security.

Course Content

UNIT I

Introduction: Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II

Mathematics Of Symmetric Cryptography: Algebraic structures - Modular arithmetic-Euclid‘s algorithm-Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation, Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution.

UNIT III

Mathematics Of Asymmetric Cryptography: Primes – Primality Testing – Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem - Chinese Remainder Theorem, Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem
– Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT IV

Message Authentication and Integrity: Authentication requirement – Authentication function – MAC – Hash function –Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication

applications - Kerberos, X.509, Email Security: Pretty Good Privacy (PGP) and S/MIME, IP security, Web security

UNIT V

Threats & Attacks: Buffer overflow, DoS, DDoS, Birthday Attack, Intrusion Detection and Prevention, SQL Injections-Phishing/ Pharming Attacks – Computer Virus.

Case Studies on Cryptography and Security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability,Virtual Elections

Recommended Books / Suggested Readings:

1. Cryptography and Network Security : William Stallings, Pearson Education,4″‘ Edition
2. Cryptography and Network Security: C K Shyamala, N Harin i, Dr T R Padmanabhan, WileyIndia, 1”
3. Douglas R. Stinson, Cryptography: Theory and Practice, Chapman and Hall
4. J. Katz and Y. Lindell, Introduction to Modern Cryptography, CRC press
5. Cryptography and Network Security : Forouzan Mukhopadhyay, MC Graw Hill, 2″” Edition
6. Information Security, Principles and Practice: Mark Stamp, Wiley India.
7. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
8. Network Securityand Cryptography: Bernard Menezes, CENGAGE Learning

BTCY511: CRYPTOGRAPHY LABORATORY

Credits: 1

LTP: 0 0 2

COURSE Description:

The course aims to equip the students with the practical exposure on basic security attacks, encryption algorithms,authentication techniques. Apart from security algorithms, firewall configuration is also introduced. This course includes deeper understanding of cryptography, its application to network security, threats /vulnerabilitiesto networks and counter measures.

COURSE OUTCOMES:

At the end of this course students will be able to:

CO1: Understand basic cryptographic algorithms, message and web authentication and security issues.

CO2: Identify basic security attacks and services

CO3: Use symmetric and asymmetric key algorithms for cryptography.

CO4. Use of Authentication functions

List of Experiments:

1. Write a program that contains a string (char pointer) with a value ***Hello world***. The program should XOR each character in this string with 0 and displays the result.
2. Write a program that contains a string (char pointer) with a value ***Hello world***. The program should AND, ORand XOReach character in this string with 127 and display the result.
3. Write a program to perform encryption and decryption using the following algorithms
    a. Ceaser cipher
    b. Substitution cipher
    c. Hill Cipher
    d. Feistel Cipher
4. Write a program to implement the DES algorithm logic.
5. Write a program to implement the AES algorithm logic
6. Write a program to implement the Blowfish algorithm logic.
7. Write a program to implement Pure Transposition Cipher.
8. Write the RC4 logic in Java Using Java cryptography; encrypt the text ***Hello world*** using Blowfish. Create your ownkey using Java key tool.
9. Write a program to implement RSA algorithm.
10. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
11. Implement the SIGNATURE SCHEME - Digital Signature Standard.

12. Calculate the message digest of a text using the SHA-1 algorithm.
13. Calculate the message digest of a text using the MD5 algorithm.
14. Write a program to Implement Hash Function

BTBD501: DATA VISUALIZATION

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with visualizing and handling data using R programming. Thiscourse includes visualization, Visualizing Distributions, visualizing associations & time series and visualizing uncertainty.

Course Outcomes (CO):

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

CO1: Interpret basics of Data Visualization

CO2: Implement visualization of distributions

CO3: Write programs on visualization of time series, proportions & associations

CO4: Apply visualization on Trends and uncertainty

CO5: Explain principles of proportions.

UNIT I

Introduction to Visualization: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales MapData Values onto Aesthetics, Coordinate Systems and Axes-Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales-Color asa Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight, Directory of Visualizations- Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

UNIT II

Visualizing Distributions: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots- Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

UNIT III

Visualizing Associations & Time Series: Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, ACase for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total, Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Tree maps, Nested Pies, Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data.Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series andDose–Response Curves, Time Series of Two or More Response Variable

UNIT IV

Visualizing Uncertianity: Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form,

Detrending and Time-Series Decomposition, Visualizing Geospatial Data- Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizingthe Uncertainty of Curve Fits, Hypothetical Outcome Plot.

Principle of Proportional Ink: The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points-Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Color Use-Encoding Too Much or Irrelevant Information, Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-Vision Deficiency

Recommended Books / Suggested Readings:

1. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization,O'Reilly ,2016
2. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems,Apress, 2018.

BTBD521: DATA VISUALIZATION LABORATORY

Credits: 1
LTP:3 0 0

COURSE Description:

The course aims to equip the students with the practical exposure on the importance of data visualization for businessintelligence and decision making.

This course includes data visualization tools.

COURSE OUTCOMES:

At the end of this course students will be able to:

CO1: Use Python, R and Tableau for data visualization.

CO2: Apply data visuals to convey trends in data over time using tableau.

CO3: Construct effective data visuals to solve workplace problems.

CO4: Explore and work with different plotting libraries.

CO5: Understand and create effective visualizations

List of Experiments:

1. Introduction to various Data Visualization tools
2. Basic Visualization in Python
3. Basic Visualization in R
4. Introduction to Tableau and Installation
5. Connecting to Data and preparing data for visualization in Tableau
6. Data Aggregation and Statistical functions in Tableau
7. Data Visualizations in Tableau
8. Basic Dashboards in Tableau

ELECTIVE – IV

BTFS602: Front End Framework using Angular

Credits: 3
LTP:3 0 0

Course Description:
This course aims to provide this course is to impart the knowledge of Front End framework for web programming. Students will learn advanced web programming concepts related to Angular JS.

Course Outcomes:
On successful completion of the course students will be able to:
CO1. Understand the fundamentals of Angular Forms and its architecture.
CO2. Use various Angular features including directives, components and services.
CO3. Apply a functional front-end web application using Angular.
CO4. Create insightful visualizations to identify patterns from data.
CO5. Implement Modules, Services, Ajax in AngularJS and Single page application(SPA).

Course Contents:

UNIT-I

Introduction: Angular JS Basics and Syntax of Angular JS, Features, Advantages, Application Structure, Basics of routes and navigation, MVC with Angular JS, Services.

UNIT-II

Expressions and Data Biding: Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behavior, Understanding Data binding.

UNIT-III

Working with Directives: Conditional Directives, Styles Directives, Mouse and Keyboard Events Directives.
Controllers: Understanding Controllers, Programming Controllers & $scope object, Adding Behavior to a Scope Object, Passing Parameters to the Methods, Having Array as members in Controller Scope, Nested Controllers and Scope Inheritance, Multiple Controllers and their scopes.

UNIT-IV

Filters: Built-In Filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrderBy Filter.
Forms: Using Simple Form Working with Select and Options, Input Validations, Using CSS classes, Form Events, Custom Model update triggers, Custom Validations.

UNIT-V

Modules: Module, Module Loading and Dependencies, Recommended Setup of Application, Creation vs Retrieval.
Services : Understanding Services, Developing Creating Services, Using a Service, Injecting Dependencies in a Service.
Ajax in AngularJS: $http Service, $q Service, Ajax Implementation using $http and $q Service.
Routing: introduction to SPA (Single page application) and how to perform routing in angular framework.

Recommended Books / Suggested Readings:

1. Sandeep Panda, "AngularJS: Novice to Ninja: Elegant, Powerful, Testable, Extendable ", SitePoint; 1 edition , 2014.
2. Brad Green and Shyam Seshadri, "AngularJS – Up and Running", O′Reilly; 1 edition, 2014.
3. Ari Lerner, Ng-Book: The Complete Book on Angularjs, Lightning Source Inc; 1 edition.

BTCC604: CLOUD SECURITY

Credits: 3

LTP:3 0 0

Course Description:

The course delves deep into the secure cloud architectural aspects with regards to identifying and mitigating risks, protection and isolation of physical & logical infrastructures including compute, network and storage, comprehensive data protection at all OSI layers, end-to-end identity management & access control, monitoring and auditing processes and meeting compliance with industry and regulatory mandates.

Course Outcomes (CO):

Upon completion of the course students should be able to:

CO1: Describe the security architecture of cloud computing and security service models.

CO2: Analyze the Strategies for Secure Operation the cloud architecture and list the security requirements. **CO3:** Explain different key strategies for data security and apply the best practice models in real time application**CO4:** Apply the security model for cloud application with network, data and security considerations.

CO5: Develop an information security framework model for cloud operation.

Course Content:

UNIT I

Cloud Computing: Security Concerns- Risk Tolerance- Legal and Regulatory Issues, Security Requirements for the Cloud Computing: Security Concerns- Risk Tolerance- Legal and Regulatory Issues, Security Requirements Architecture- Security Patterns and Architectural Elements-Cloud Security Architecture-Key Strategies for Secure Operation

UNIT II

Overview of Data Security in Cloud Computing: Common Risks with Cloud Data Security- Data Encryption: Applications and Limits- Errors with Data Encryption- Cloud Data Security: Sensitive Data Categorization, Cloud Data Storage-Roach Motel Syndrome, Overall Strategy: Effectively Managing Risk, Overview of Security Controls, Overviewof Security Controls, The Limits of Security Controls, Best Practices, Security Monitoring

UNIT III

Private Clouds: Motivation and Overview-Security Implications: Shared versus Dedicated Resources, Security Criteria for Ensuring a Private Cloud - Network Considerations- Data Center Considerations- Operational Security Considerations- Regulation, Selecting a CSP: Overview of Assurance, Overview of Risks, Security Criteria- Revisiting Defense-in-depth- Additional Security relevant Criteria

UNIT IV

Evaluating Cloud Security, Checklists for Evaluating Cloud Security- Foundational Security Business Considerations - Defense-in-depth- Operational Security, operating a Cloud: From Architecture to Efficient

and Secure Operations, Bootstrapping Secure Operations, Security Operations Activities- Business Continuity, Backup, and Recovery- ManagingChanges in Operational Environments - Information Security Management - Vulnerability and Penetration Testing, Security Monitoring and Response

Recommended Books / Suggested Readings:

1. Sushil Jajodia, Krishna Kant, "Secure Cloud Computing", Elsevier,2014.
2. Curtis Franklin, Jr. ,Brian J. S. Chee, "Securing the Cloud: Security Strategies for the Ubiquitous Data Center", CRC Press,2019.

BTCC603: INFORMATION SECURITY

Credits: 3

LTP:3 0 0

Course Description:

The course covers various important topics concern to information security like symmetric and asymmetric cryptography,hashing, message and user authentication, digital signatures, key distribution and overview of the malware technologies. The subject also covers the applications of all of these in real life applications.

Course Outcomes

Upon completion of the course students should be able to:

CO1: Explore the basic principles of the symmetric cryptography and techniques with their strengths and weaknesses fromperspective of cryptanalysis.

CO2: Implement and analyze various symmetric key cryptography algorithms and their application in different context.

CO3: Compare public key cryptography with private key cryptography and Implement various asymmetric key cryptographyalgorithms.

CO4: Explore the concept of hashing and implement various hashing algorithms for message integrity.

CO5: Use the techniques and standards of digital signature, key management and authentication.

Course Content

UNIT I

Symmetric Cipher Model, Cryptography, Cryptanalysis and Attacks; Substitution and Transposition techniques. Stream ciphers and block ciphers, Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation

UNIT-II

Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, OutputFeedback mode, Counter mode.

Public Key Cryptosystems with Applications, Requirements and Cryptanalysis, RSA algorithm, its computational aspectsand security, Diffie-Hillman Key Exchange algorithm, Man-in-Middle attack.

UNIT-III

Cryptographic Hash Functions, their applications, Simple hash functions, its requirements and security, Hash functionsbased on Cipher Block Chaining, Secure Hash Algorithm (SHA)

Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on BlockCiphers.

UNIT-IV

Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NISTdigital Signature algorithm.

Key management and distribution, symmetric key distribution using symmetric and asymmetric encryptions, distribution ofpublic keys, X.509 certificates.

Recommended Books / Suggested Readings:

1. Cryptography and Network Security, Principles and Practice Sixth Edition, William Stallings, Pearson.
2. Information Security Principles and Practice by Mark Stamp, Willy India Edition
3. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill 4.
4. Cryptography and Network Security Atul Kahate, TMH
5. Cryptography and Security, C K Shyamala, N Harini, T R Padmanabhan, Wiley-India
6. Information Systems Security, Godbole, Wiley-India
7. Information Security Principles and Practice, Deven Shah, Wiley-India
8. Security in Computing by Pfleeger and Pfleeger, PHI

Build Your Own Security Lab: A Field Guide for network testing, Michael Gregg, Wiley India

BTCC609: NATURAL LANGUAGE PROCESSING

Credits: 3

LTP:3 0 0

Course Description: Course Description: The course aims to equip the students with fundamental knowledge of Natural Language Processing and applying knowledge to implement real time problems in fields of natural languages.

The course includes Natural Language Processing basics, Language Modeling and Part of Speech Tagging, Words andWord Forms, and Applications and recent trends in NLP .

Course Outcomes (CLO):

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

CO1: CO1: Apply knowledge of computing and mathematics appropriate to the discipline

CO2: Analyze a problem, identify and define the computing requirements appropriate to its solution. CO3: Illustrate computational methods to understand language phenomena of word sense disambiguation.

CO4: Analyze and test algorithms for NLP problems & mathematical and linguistic foundations underlying approaches to thevarious areas in NLP.

CO5: Apply NLP techniques to design real world NLP applications such as text categorization, text summarization,information extraction

Course Content

UNIT I

Introduction: What is NLP? Why NLP is Difficult? History of NLP, Advantages of NLP, Disadvantages of NLP,Components of NLP, Applications of NLP, how to build an NLP pipeline? Phases of NLP, NLP APIs, NLP Libraries

UNIT II

Words and Word Forms: Bag of words, skip-gram, Continuous Bag-Of-Words, embedding representations for words Lexical Semantics, Word Sense Disambiguation, Knowledge Based and Supervised Word Sense Disambiguation.

UNIT III

Lexical Semantics, Attachment for fragment of English- sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, Robust Word SenseDisambiguation (WSD) ,Dictionary based approach ,Pragmatics.

UNIT IV

Applications and recent trends in NLP: Information retrieval, Question answers system, categorization, text summarization,sentiment analysis, Named Entity Recognition, spam filter speech recognition.

Reference Books:

1. Daniel and Martin J. H., "Speech and Language Processing: An Introduction to Natural Language Processing,Computational Linguistics and Speech Recognition", Prentice Hall, 2009.
2. Speech and Language Processing: AnIntroduction to Natural Language Processing, Computational
3. Linguistics and Speech Recognition Jurafsky, David, and James H. Martin, PEARSON
4. Foundations of Statistical Natural Language Processing, Manning, Christopher D., and Hinrich Schütze,Cambridge, MA: MIT Press
5. Natural Language Understanding, James Allen. The Benjamin/Cummings Publishing Company Inc..
6. Natural Language Processing with Python – Analyzing Text with the Natural Language ToolkitStevenBird, Ewan Klein, and Edward Loper.

ELECTIVE-V

BTFS601: MOBILE APPLICATION DEVELOPMENT

Credits: 3

LTP:3 0 0

Course Description:

The course aims to equip the students to understand, how to develop and deploy an application to theapp market.

Course Objectives

Upon completion of the course students should be able to:

CO1: Describe the platforms upon which the Android OS will run.

CO2: Understand the basics of Android platform and get to understand the application lifecycle

CO3: Write simple GUI applications, use built-in widgets and components, work with the database to storedata locally.

CO4: Explains how to customize activities and intents, create rich user interfaces, and manage data

CO5: Create an application that use multimedia under Android OS.

Course Content

UNIT I

Introduction: Brief History of mobile technologies, Different mobile technologies, Introduction to Android, Setting up development environment, Dalvik Virtual Machine & .apk file extension, Fundamentals, Basic Building blocks - Activities, Services, Broadcast Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents & Intent Filters, Android API levels (versions & version names)

Application Structure: AndroidManifest.xml, Uses-permission & uses-sdk, Resources & R.java, Assets, Layouts &Drawable Resources, Activities and Activity lifecycle.

UNIT-II

Emulator-Android Virtual Device: Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS, Creating your first project The manifest file Layout resource Running your app on Emulator, switching between activities, Develop an app for demonstrating the communication between Intents Basic UI design**,** Preferences, Menu, Intents, UI Design, Tabs and Tab Activity, Styles & Themes: drawable resources forshapes, gradients (selectors), style attribute in layout file.

UNIT-III

SQL Database: Introducing SQLite, SQLiteOpenHelper and creating a Database, Opening and closing Database, DML &DDL Queries in brief, Working with cursors inserts, updates and deletes. SQL Database Demo.

Content Providers: SQLite Programming, SQLiteOpenHelper, SQL-Lite-Database , Cursor, Reading and updating Contacts,Reading bookmarks

Adapters and Widgets: Array Adapters, Base Adapters, List View and List Activity, Custom list view, Grid View usingadapters, Gallery using adapters.

UNIT-IV

Notifications: Broadcast Receivers, Services and notifications, Toast, Alarms, Custom components: Custom Tabs, Customanimated popup panels, Other components, Threads: Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable

Networking: Consuming Web Services Using HTTP, Consuming JSON Services, Sockets Programming

UNIT-V

Developing Android Services: Creating Your Own Services, Establishing Communication between a Service and anActivity, Binding Activities to Services, Understanding Threading

Publishing Android Applications: Preparing for Publishing, Deploying APK Files

Recommended Books / Suggested Readings:

1. Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROXPublication.
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 Press2013.

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BTFS611: MOBILE APPLICATION DEVELOPMENT LABORATORY

Credits: 1

LTP:0 0 2

Course Description:

This is a practical course on Mobile Application Development and student will learn how to program in Android Platform anddevelop applications using SQLite that run on Android Operating System.

Course Outcomes (CO):

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

CO1: Design and develop user interfaces for mobile apps using basic building blocks, UI components and applicationstructure using Emulator.

CO2: Write simple programs and develop small applications using the concepts of UI design, layouts and preferences

CO3: Develop applications with multiple activities using intents, array adapter, exceptions and options menu.

CO4: Implement activities with dialogs, spinner, fragments and navigation drawer by applying themes

CO5: Develop mobile applications using SQLite.

List of Experiments:

1. Develop a program to display Hello World on screen.
2. Develop a program to implement linear layout and absolute layout.
3. Develop a program to implement frame layout, table layout and relative layout.
4. Develop a program to implement Text View and Edit Text.
5. Develop a program to implement AutoComplete Text View.
6. Develop a program to implement Button, Image Button and Toggle Button.
7. Develop a program to implement login window using above UI controls.
8. Develop a program to implement Checkbox.
9. Develop a program to implement Radio Button and Radio Group
10. Develop a program to implement Progress Bar.
11. Develop a program to implement List View, Grid View, Image View and Scroll View.
12. Develop a program to implement Custom Toast Alert.
13. Develop a program to implement Date and Time Picker.
14. Develop a program to create an activity
15. Develop a program to implement new activity using explicit intent and implicit intent.
16. Develop a program to implement content provider.
17. Develop a program to implement service.
18. Develop a program to implement broadcast receiver.
19. Develop a program to implement sensors.
20. Develop a program to build Camera.

21. Develop a program for providing Bluetooth connectivity.
22. SQLite Programming
23. Create sample application with login module. (Check username and password) On successful login, Change TextView "Login Successful" and on login fail, alert user using Toast "Login fail"
24. Create login application where you will have to validate username and password till the username andpassword is not validated, login button should remain disabled.
25. Write a mobile application that creates alarm clock
26. Develop a program to a) Send SMS b) Receive SMS
    Develop a program to send and receive e-mail.

BCS543: DOT NET TECHNOLOGIES

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students to understand the .NET technologies for C# programming, web development and to enable them to design and construct dynamic and responsive apps for the web. Explain to students the benefits of using.NET technologies and their features. This course includes basics of C#, application development on .NET, web-based application development on .NET, and CLR and .NET framework**Course Outcomes (CO):**

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

CO1: Describe the concept of .Net Framework and C# language fundamentals.

CO2: Develop the console and GUI applications using .Net technology.

CO3: Implement various controls for Creating a web Application.

CO4: Use .NET framework, tools for developing applications.

Course Content

UNIT I

Introduction to C#: Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

UNIT II

Object Oriented Aspects of C#: Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading,delegates, events, errors and exception, Threading.

UNIT III

Application Development On .NET: Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box (Modaland Modeless), accessingdata with ADO.NET, Dataset, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT IV

Web Based Application Development On .NET: Programming web application with web forms, ASP.NET introduction,working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQLServer

UNIT V

CLR AND .NET FRAMEWORK: Assemblies, Versioning, Attributes, reflection, viewing meta data, type

discovery,reflection on type, marshalling, remoting, security

Recommended Books / Suggested Readings:

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.
3. Andrew Troelsen , "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
4. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O"Reilly, 2010

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BCS527: DOT NET TECHNOLOGIES LABORATORY

Credits: 1

LTP:0 0 2

Course Description: The course aims to equip the students with the practical aspects of multi-tier application developmentusing the .NET framework. The goal of this course is to introduce the studentsto the basics of distributed application development.

Course Outcomes (CO):

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

CO1: Develop ASP.NET Web Services, secure web services, and .NETremoting applications

CO2: Utilize the .NET framework to build distributed enterprise applications

CO3: Understand the development and deployment cycles of enterprise applications.

List of Experiments

1. Write a program for Arithmetic Calculator using Windows Application.
2. Implement Windows Form based application using controls like menus, dialog and tool tip,dropdown, radioand selection button etc.
3. Implement Master Form with Windows application
4. Write a program for events and Delegates.
5. Implement concepts of Inheritance, visual inheritance and Interface in windows application
6. Use Data Controls like Data List, Grid View, Detail View, Repeater and List Bound Control
7. Implement web application using ASP.NET with web controls.
8. Create a Web application that illustrates the use of themes and master pages with Site-Map
9. Create a Web Application in ASP.NET using various CSS.
10. Create the simple to demonstrate the AJAX concept using AJAX toolkit. Write a programto check whether empty query string is entered in Asp .net.
11. Game Development

BCS645: Ethical Hacking Credits: 3

Credits 3

LTP:3 0 0

Course Description:

The ethical hacking covers the theory and practices of finding the vulnerabilities through forming the different attacks andthen defining the appropriate security policy including the action to detect or prevent the attacks and thus reduce the damages.

Course Outcomes:

On successful completion of the course students will be able to:

CO1. Understand the basics of the ethical hacking.

CO2. Perform the foot printing and scanning.

CO3. Demonstrate the techniques for system hacking.

CO4. Determine the signature of different attacks and prevent them.

CO5. Detect and prevent the security attacks in different environments.

Course Contents:

UNIT I

Ethical hacking, Foot Printing: information gathering methodology, Hacking Tools, Scanning- Definition, Typesof Scanning, Objectives of Scanning, Scanning Methodology, Counter measures; Enumeration- NetBios Null Sessions, hacking tools - Enumerating User Accounts, Active Directory Enumeration and Countermeasures; System Hacking- Administrator password guessing, Password Cracking Algorithm, Automated Password Cracking, Types of Password Attacks, Hacking tools.

UNIT II

Trojans and Backdoors: Overt and Covert Channels, Indications of a Trojan Attack, Reverse Engineering Trojans, Backdoor Countermeasures; Sniffers- Working of Sniffer, Passive Sniffing, Active Sniffing, Hacking tools, Sniffing Countermeasures; Denial of Service- Goal of DoS, Impact and Modes of Attack, DoS Attack Classification, Countermeasures for Reflected DoS, Tools for Detecting DDoS Attacks.

UNIT III

Session Hijacking: Spoofing vs Hijacking, Steps in Session Hijacking, Types of Session Hijacking, Hacking Tools, Protection against Session Hijacking, IP Security; Hacking Web Servers- Popular Web Servers and Common Security Threats, Apache Vulnerability, Attack against IIS Console, Hacking Tools, Countermeasures, Increasing Web Server Security; Web Application Vulnerabilities-Web Application Hacking, Anatomy of an Attack, Web Application Threats, Carnivore, Google Hacking, Countermeasures.

UNIT IV

Web Based Password Cracking Techniques: Authentication mechanisms, Password Guessing, Cookies, PasswordCrackers Available, Hacking Tools, Countermeasures; SQL Injection- Attacking SQL Servers, SQL Server Resolution Service (SSRS), sql-L Probing, SQL Server Talks, Preventive Measures; Hacking Wireless

Networks

– Rouge Access Points, Scanning Tools, Sniffing Tools, Securing Wireless Networks.

UNIT-V

Linux Hacking : Linux Vulnerabilities, Scanning Tools, Scanning Tools, Linux Security Tools, Advanced Intrusion Detection System, Linux Security Auditing Tool; Evading Firewalls, Intrusion Detection Systems, Intrusion Detection Tools, Penetration Testing – Penetration Test vs Vulnerability Test, Reliance on Checklists and Templates, Phases of Penetration Testing, Risk Analysis, Active Reconnaissance.

Recommended Books / Suggested Readings:

1. Manish Kumar; The Secret of Hacking; Third Edition; Publisher Leo Impact Security Services.2.Ankit Fadia; An Unofficial Guide to Ethical Hacking 2nd Edition; Macmillan India;2006.
2. Eric Cole; Hackers Beware: The Ultimate Guide to Network Security; Publisher Sams
3. Nitesh Dhanjani, Billy Rios, Brett Brett; Hacking: The Next Generation, Publisher Shroff/o'reilly (2009)

BCS665: Ethical Hacking Laboratory

Credits: 1

LTP:0 0 2

Course Description: The course aims that the students practices of finding the vulnerabilities through forming the different attacks and then defining the appropriate security policy including the action to detect or prevent the attacks and thus reducethe damages.

Course Outcomes (CLO):

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

CO1: Develop the foot printing and scanning

CO2: Demonstrate the techniques for system hacking

CO3: Determine the signature of different attacks and prevent them **CO4:** Identify and prevent the security attacks in different environments.**List of Experiments:**

1. List the tools for Ethical Hacking.
2. Implement Footprinting and Reconnaissance using tools 3d Traceroute, Alchemy Eye, DNS Toolsand Network SolutionWhois.
3. Implement Network Scanning using tools Advanced Port Scanner, Colasoft Ping Tool, Hide YourIP Address, Nessus andNmap.
4. Implement Enumeration using tools Default Password List, Default Password List, OpUtil NetworkMonitoring Tool andOpUtil Network Monitoring Tool.
5. Implement system hacking using tools Actual spy, Alchemy Remote Executor, Armor Tool andFSecureBlackLight.
6. Implement Trojan and Backdoors using tools Absolute Startup Manager, Absolute Startup Manager, Netwirx ServicesMonitor and StartEd Lite.
7. Implement Viruses and Worms using tools Anubis Analyzing UnknownBinaries, Filterbit, Sunbelt CWSandbox andThreatExpert.
8. Implement sniffers using tools Colasoft Capsa Network Analyzer, EffeTech HTTP Sniffer, PacketSniffer and PRTGNetwork Monitor.
9. Write a research paper in which Ethical Hacking tools are used to address anyproblem definitionin cyber security

BTBD601: R Programming

Credits: 3

LTP:3 0 0

Course Description:

This course aims to provide a introduction to the R programming language. By the end of course, the student will becomfortable operating in the R environment, including importing external data, manipulating data for specific needs,and running summary statistics and visualizations.

Course Outcomes:

On successful completion of the course students will be able to:

CO1. Understand basic concepts of R.

CO2. Create list, data frames and implement the same.

CO3. Conduct exploratory data analysis using R.

CO4. Create insightful visualizations to identify patterns from data.

CO5. Use statistical estimates to make meaningful predictions from data.

Course Contents:

UNIT-I

The R Programming Language: Basic concepts, definitions and notations, R as a calculator, Identifiers, constants, R datatypes, R- Objects: Vectors, Lists, Matrices, Arrays, Factors, Data Frames; Atomic and Recursive Variables, R-Operators.

UNIT-II

Conditional statements and Control structures, Looping constructs and Loop control statements. Function in R Programming- Components of a Function, Built in and user defined Functions, Vector and Matrix manipulation functions,R -strings and string manipulation functions.

UNIT-III

Scoping rules in R, Package in R- Installing and Loading Packages in R, using help, access functions from packages.Getting Data In and Out of R - Importing data from excel, Working with data from files, importing larger Data Sets,loading data from databases, Working with structured and unstructured data, Reading from URL, Storing data usingR functions.

UNIT-IV

Exploring data- Using summary statistics, Visually inspecting data - Histograms and Density plots, Dot Plots, Line Charts, Pie Charts, Boxplots, Scatterplots, saving and exporting results. R for managing data-Data cleansing, Treating missing values, data transformations, sampling data for modeling- test and training splits, creating sample groups, Datareduction.

UNIT-V

R For Basic Statistics: Descriptive Statistics: arithmetic mean, median, Measure of dispersion - Minimum and Maximumvalues, quantiles, percentiles, IQR, standard deviation, variance. Linear regression – using linear and

logistic regression and making predictions. Characterizing prediction quality. Using correlation to find relations between variables –Pearson,Kendall and Spearman tests.

Recommended Books / Suggested Readings:

1. Data Science with R: A Step By Step Guide with Visual Illustrations & Examples, Andrew Oleksy.
2. Practical Data Science with R, Nina Zumel and John Mount, Dreamtech/Manning, 2014
3. R Programming for Data Science, Roger D. Peng, Lean publishing, 2015.
4. S. G. Purohit, Gore,S.D. and S. R. Dehmuk, Statistical Analysis using R,Narosha Publishing, 2019.

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BTBD621: R PROGRAMMING LABORATORY

Credits: 1

LTP:0 0 2

Course Description: Basically, R is a functional and object-oriented programming language. This means the function is thecentral element of software and analyses. In this lab course, we deal intensively with writing and testing functions in R. **Course Outcomes (CO):**

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

CO 1: Show the installation of R Programming Environment.

CO 2: Utilize and R Data types for developing programs.

CO 3: Make use of different R Data Structures.

CO 4: Develop programming logic using R Packages.

CO 5: Analyze the datasets using R programming capabilities.

List of experiments:

1. Download and install R-Programming environment and install basic packages.
2. Using install Packages () command in R.
3. Learn all the basics of R-Programming (Data types, Variables, Operators etc.)
4. Implement R-Loops with different examples.
5. Learn the basics of functions in R and implement them with examples.
6. Implement data frames in R. Write a program to join columns and rows in a data. frame using cbind() and rbind() inR.
7. Implement different String Manipulation functions in R.
8. Implement different data structures in R (Vectors, Lists, Data Frames)
9. Write a program to read a csv file and analyze the data in the file in R
10. Create pie charts and bar charts using R.
11. Create a data set and do statistical analysis on the data using R.

ELECTIVE-VI

BTFS702: Python Web Development
Credits: 3

LTP:3 0 0

Course Description: This course helps to determine the understand Django fundamentals and use its concepts to build and deploy robust web applications and apps.

Course Outcomes (CO):

CO1: Understand how to Implement Python based applications.
CO2: Use MVC (Models, Views & Templates).
CO3: Integrate with RESTful web services.
CO4: Build and deploy robust Django web apps.

Course Contents

UNIT,I

Python: Object Oriented Programming: Class Definition, Instantiation, Sub Classing, Inner Classes, Regular Expressions, inheriting from other classes, Class and Static Methods, Private Methods, Polymorphism, importing python modules and libraries, creating objects, Manipulating and working with objects.

UNIT,II

DJANGO: Creating the Project, Running the Development Server, Creating the Application, designing a Model, setting up the Database, Setting up the Application, Dynamic Web Sites, Communication, Data Storage, Presentation.

UNIT,III

Django Architecture: Django and Python, Django stake on MVC: Models, Views and Template, Overall Django Architecture, 3 Core Files: models.py, urls.py, views.py ,URL's, Modelling HTTP: Requests; Responses and Middleware ,Views / Logic.

UNIT,IV

DJANGO FORMS AND APIS: Templates, Forms, Validation ,Authentication, Advanced Forms processing techniques, Django REST framework ,Django piston.

UNIT,V

Application Essentials: Creation of simple interactive applications, Simple database applications, Multimedia applications, Design and development of information systems, Personal Information System, Information retrieval system, social networking applications

Suggested Reading/Textbooks Reading

1. Python Web Development with Django 1st Edition by Jeff Forcier ; Paul Bissex; Wesley Chun; Pearson Education; 2009.
2. Think Python, 2nd Edition , How to Think Like a Computer Scientist , Allen B. Downey ,2 nd Edition, Shroff / O'Reilly Publication, 2016.

3. Django for Beginners: Build websites with Python and Django Paperback, William S Vincent, Independently Published, 2018 Design Patterns by Erich Gamma, Pearson Education.

BTCC604: Cloud Security
Credits: 3
LTP:3 0 0

Course Description:
The course delves deep into the secure cloud architectural aspects with regards to identifying and mitigating risks, protection and isolation of physical & logical infrastructures including compute, network and storage, comprehensive data protection at all OSI layers, end-to-end identity management & access control, monitoring and auditing processes and meeting compliance with industry and regulatory mandates.

Course Outcomes (CO):

Upon completion of the course students should be able to:

CO1: Describe the security architecture of cloud computing and security service models.
CO2: Analyze the Strategies for Secure Operation the cloud architecture and list the securityrequirements.
CO3: Explain different key strategies for data security and apply the best practice models in real timeapplication
CO4: Apply the security model for cloud application with network, data and security considerations.
CO5: Develop an information security framework model for cloud operation

Course Content:

UNIT I

Cloud Computing: Security Concerns- Risk Tolerance- Legal and Regulatory Issues, Security Requirements for the Cloud Computing: Security Concerns- Risk Tolerance- Legal and Regulatory Issues, Security Requirements Architecture-Security Patterns and Architectural Elements-Cloud Security Architecture-Key Strategies for Secure Operation

UNIT II

Overview of Data Security in Cloud Computing-Common Risks with Cloud Data Security- Data Encryption: Applications and Limits- Errors with Data Encryption- Cloud Data Security: Sensitive Data Categorization, Cloud Data Storage-Roach Motel Syndrome, Overall Strategy: Effectively Managing Risk, Overview of Security Controls, Overview of Security Controls, The Limits of Security Controls, Best Practices, Security Monitoring

UNIT III

Private Clouds: Motivation and Overview-Security Implications: Shared versus Dedicated Resources, Security Criteria for Ensuring a Private Cloud - Network Considerations- Data Center Considerations- Operational Security Considerations- Regulation, Selecting a CSP: Overview of Assurance, Overview of Risks, Security Criteria-Revisiting Defense-in-depth- Additional Securityrelevant Criteria

UNIT IV

Evaluating Cloud Security, Checklists for Evaluating Cloud Security- Foundational SecurityBusinessConsiderations-Defense-in-depth- Operational Security, operating a Cloud: From Architecture to Efficient and Secure Operations, Bootstrapping Secure Operations, Security Operations Activities- Business Continuity, Backup, and Recovery-Managing Changes in Operational Environments - Information Security Management - Vulnerability and Penetration Testing, Security Monitoring andResponse

Suggested Books:

1. Sushil Jajodia, Krishna Kant, “Secure Cloud Computing”, Elsevier,2014.
2. Curtis Franklin, Jr. ,Brian J. S. Chee, “Securing the Cloud: Security Strategies for the UbiquitousData Center”, CRC Press, 2019.

BTCY605: MALWARE ANALYSIS

Credits: 3

LTP:3 0 0

Course Description:

The course aims to equip the students with how to utilize various tools and strategies to do basic static analysis in order toidentify, detect, and eradicate malware threats. To learn about live malware attack monitoring and analysis, as well as livenetwork traffic analysis.

The course includes detection, analysis, understanding, controlling, and eradication of malware.

Course Outcomes (CO):

After completion of this course students will be able to -

CO1: Analyze the modern malware samples usingboth static and dynamic analysis techniques.

CO2: Understand the executable formats, Windows internals and API s, andmalware analysis techniques.

CO3: Extract investigative leads from host and network-based indicators associated with a maliciousprogram.

CO4: Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysistechniques in futuremalware samples.

CO5: Describe the industry standard tools including ProcMon, CFF Explorer,ProcExplore, BinText, FileAlyzer, OllyDbgetc.

Course Content

UNIT I

INTRODUCTION TO MALWARE ANALYSIS: Malware taxonomy - Malware threats - Malware analysis methodologies - Legal considerations - Identifying and protecting against malware - Malware hiding places - Collecting malware from live system - Identifying malware in dead system Malware Analysis Environment : Virtual machine - Real systems - Malware analysis tools ProcMon, CFF Explorer, ProcExplore, BinText, FileAlyzer, OllyDbg

UNIT II

STATIC ANALYSIS: Detailed file analysis -Database of file hashes. Identifying file compile date Identifying packing/ obfuscation methods - Strings analysis - File signature analysis - Local and onlinemalware scanning -Identifying file dependencies.

DYNAMIC ANALYSIS: System base lining - Host integrity- Monitor - Installation monitor - Processmonitor - File monitor

- Registry analysis/ monitoring - Network traffic monitoring/ analysis - Port monitor - DNS monitoring/ resolution - Simulating internet services

UNIT III

CODE ANALYSIS: Reverse engineering malicious code - Identifying malware passwords - Bypassing authentication - Assembly level computing Standard x86 instructions, Introduction to IDA,Olly Dbg, Advanced malware analysis Virus, Trojan. Parsing Basic analysis of an APK

UNIT IV

MALICIOUS DOCUMENT ANALYSIS: PDF and Microsoft Office document structures - PDF andoffice document vulnerabilities - Malware extraction and analysis tools - Analysis of malicious documents

MALWARE CHALLENGES: Virtual environment - Live internet connection - Real, fake, and virtual services -Anti- debug and anti-forensic malware

UNIT V

MOBILE MALWARE ANALYSIS: Need for mobile application penetration testing, testing methodology Android andiOS Vulnerabilities - Exploit Prevention - Handheld Exploitation- Android Root Spreading and Distribution Android Debugging.

Reference Books:

1. M. Sikorski and A. Honig, Practical Malware Analysis: The Hands-on Guide to Dissecting Malicious Software. SanFrancisco: No Starch Press San Francisco, CA, 2012. (ISBN No.: 978- 1-59-327290-6)
2. M. H. Ligh, S. Adair, and B. Hartstein, Cookbook and DVD: Tools and Techniques for FightingMalicious Code.Indianapolis, IN: Wiley, John Sons, 2010. (ISBN No. : 978-0-470-61303-0).
3. C. Eagle, The IDAPro Book: The Unofficial Guide to the worlds most popular Disassembler , 2ndEd. San Francisco:No Starch Press San Francisco, CA, 2011. (ISBN No. : 978-1-59327-289-0)

BTDA603: TIME SERIES FORECASTING

Credits 3

LTP:3 0 0

Course Description: This course covers the methodology and applications of time series analysis and forecasting, focusing on issues and problems predicting business and economic data. The course is intended to serve as a guide to the principles, assumptions, strengths, limitations, and application of time series models and forecasting methods. This course introduces concepts essential to understanding the rationale of time series analysis.

Course Outcomes (CO):

CO1: Analyse any time series data using various statistical approaches.

CO2: Know basic concepts of univariate time series analysis; build appropriate econometric time series. models.

CO3: Understand limitation and relevance of the models.

CO4: Generate reasonable forecast values, and to make concise decisions based on forecasts obtained.

Course Contents

UNIT-I

Introduction Of Timeseries Analysis: Introduction to Time Series and Forecasting, Different types of data, Internal structures of time series. Models for time series analysis, Autocorrelation and Partial autocorrelation. Examples of Time series Nature and uses of forecasting, Forecasting Process, Data for forecasting, Resources for forecasting.

UNIT-II

Statistics Background for Forecasting: Graphical Displays, Time Series Plots, Plotting Smoothed Data, Numerical Description of Time Series Data, Use of Data Transformations and Adjustments, General Approach to Time Series Modeling and Forecasting, Evaluating and Monitoring Forecasting Model Performance.

UNIT-III

TIME SERIES REGRESSION MODEL: Introduction Least Squares Estimation in Linear Regression Models, Statistical Inference in Linear Regression, Prediction of New Observations, Model Adequacy Checking, Variable Selection Methods in Regression, Generalized and Weighted Least Squares, Regression Models for General Time Series Data, Exponential Smoothing, First order and Second order.

UNIT-IV

Autoregressive Integrated Moving Average (Arima) Models: Autoregressive Moving Average (ARMA) Models – Stationary and Inevitability of ARMA Models - Checking for Stationary using Variogram- Detecting Non-stationary - Autoregressive Integrated Moving Average (ARIMA) Models - Forecasting using ARIMA - Seasonal Data -Seasonal ARIMA Models Forecasting using Seasonal ARIMA Models Introduction - Finding the “BEST” Model -Example: Internet Users Data Model Selection Criteria - Impulse Response Function to Study the Differences in Models Comparing Impulse Response Functions for Competing Models .

UNIT-V

MULTIVARIATE TIME SERIES MODELS AND FORECASTING: Multivariate Time Series Models and Forecasting, Multivariate Stationary Process, Vector ARIMA Models, Vector AR (VAR) Models, Neural Networks and Forecasting Spectral Analysis, Bayesian Methods in Forecasting.

Suggested Reading/Textbooks Reading

1. Introduction To Time Series Analysis And Forecasting, 2nd Edition, Wiley Series In Probability And Statistics, By Douglas C. Montgomery, Cheryl L. Jen (2015)
2. Master Time Series Data Processing, Visualization, And Modeling Using Python Dr. Avishek Pal Dr. Pks Prakash (2017)
3. Kendall M.G. (1976): Time Series, Charles Griffin.
4. Chatfield C. (1980): The Analysis of Time Series –An Introduction, Chapman & Hall.

ELECTIVE-VI

BTFS703: UI and UX Design
Credits: 3
LTP:3 0 0

Course Description: The course familiar with the User Interface (UI) and User Experience (UX) Design play key roles in the experience users have when interacting with digital products and applications. In this course, it covers the theory and methodologies behind UI and UX design.

Course Outcomes (CO):

CO1: Understand UX design, complexity, and perception.

CO2: Apply different levels of UX design.

CO3: Describe user interface design process, elements, and user experience design principles.

CO4: Apply framework of design thinking to design process.

CO5: Implement principles of creating good interface and different navigation schemes and menus.

Course Contents

UNIT-I

Introduction: A Brief introduction to User Experience (UX)Design, Complexity, and perception of User Experience (UX) design, Definition of User Experience (UX), What is Design? What is Design thinking? Who is a User? History of UX design: History of UX design, The Scope of User Experience (UX), The Single interaction Level, The Journey Level, The Relationship Level, Importance of User Experience (UX).

UNIT-II

User Interface (UI) Design: User Interface Design, UI Design Considerations, Design Process, Elements of Interface Design. Design principles: User Experience Design Principles (UX), Developing User Experience (UX) Design, Wireframe and its importance, Examples of wireframes, Wire framing process, Wire framing tools.

UNIT-III

Design Thinking: Introduction to Design Thinking, Origin Design Thinking, what is Design Thinking? The Design Thinking process, what are the Principles of Design Thinking? Application of the Design Thinking Framework, Examples of design thinking success.

UNIT-IV

Principles of good interface and screen design: Human considerations in Interface and Screen Design, The Test for a Good Design, Organizing Elements clearly and meaningfully, Visually Pleasing Composition, Focus and Emphasis.

UNIT-V

Develop system menus and navigation schemes: Structures of Menus, Functions of Menus, Content of Menus, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Kinds of Graphical Menus.

Graphics, icons, and images: Icons, Influences on Icon Usability, Choosing Icons, Choosing Icon Images, Creating Icon Images, Icon Animation and Audition, The Icon Design Process, Multimedia, Graphics.

Suggested Reading/Textbooks Reading

1. UX and UI: A Step-by-Step Guide on UX and UI Design, by PAMAL
2. A B. DEACON.
3. The Essential Guide to User Interface Design by Wilbert O. Galitz.
4. A Project guide to UX Design, Russ Unger and Carolyn Chandler, Second Edition.
5. Learn UX: Applying Lean Principles to Improve User Experience by Jeff
6. The Elements of User Experience: User-centred Design for the Web by Jesse James Garette.

BTCC701: Cloud Database Management

Credits: 3

LTP:3 0 0

Course Description: The course is to impart an understanding of the need of cloud storage, its architecture the different cloud storage systems, their comparative merits and suitability to task specific deployment. The course will discuss the various enabling technologies for cloud storage.

Course Outcomes (CO):

CO1: Propose a plan to store, maintain, and deliver the massive amounts of media, software, documents, and other digital objects.

CO2: Understand how to Store/ access data using different cloud storage technologies for a range of applications.

CO3: Explain the various architectures of different cloud storage.

CO4: Describe approaches to virtualize and integrate multiple storage platforms.

CO5: Devise a plan to secure and manage the storage infrastructure.

Course Contents

UNIT,I

Essentials of Storage Types of Storage, Data Processing: Local, Directly Attached, Remote, File Systems & Volume Management, Distributed/Clustered File Systems, Concatenation, Partitioning, etc. ,RAIDs: Descriptions, Comparison, I/O & Capacity: Concatenation, Vertical Tier, Disk Splitting, Storage Taxonomy, Storage Levels: Block, File, Object, Backup , Snapshots, Disaster Recovery/Protection, Recovery Time, Caching, Replication**.**

UNIT,II

Storage Technology Devices Storage Network Adapters (HBAs, SNICs and HCAs), NAS appliances, servers and gateways ,Storage devices: JBOD and disk array subsystem, Modular subsystem, Frame storage subsystem, Solid state disks, memory disks, and SAN cache ,Network Components: Hubs and concentrators ,Switches and directors ,Bridges, gateways and router devices ,Intelligent switches, multifunction switches and storage domain controllers.

UNIT,III

Fiber Channel Storage Area Networks & Intelligent Storage System, Components of FC SAN, FC Connectivity ,Switched fabric ports ,Fiber channel architecture ,Link services ,Fabric services. Components of intelligent storage system: front,end, back,end and physical disk ,Storage provisioning: traditional and virtual ,Types of intelligent storage systems.

UNIT,IV

Storage Virtualization, Virtualization in I/O path, limitations and requirements, Storage virtualization definition, Implementation consideration, Storage virtualization on block and file level, Storage virtualization on various levels of storage network: server, storage devices and network

UNIT,V

Securing the Storage Infrastructure Information security framework, Risk triad, Storage security domains, Security implementation in storage networking, Securing storage infrastructure in virtualized and cloud environments.

Suggested Reading/Textbooks Reading

1. Greg Schulz: Cloud and virtual data storage networking, ISBN-13: 978- 1439851739, Auerbach Publications, 2011.
2. Hitachi Data Systems Academy: Storage Concepts: Storing and Managing Digital Data (Volume1). ISBN-13: 978-0615656496, 2012.
3. EMC education services. Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments, ISBN-13: 978-1118094839, Wiley, 2012.
4. Richard Barker, Paul Massiglia 2002, Storage area network essentials, Wiley New York.
5. IBM Redbook "Introduction to Storage Area networks and System Networking" http://www.redbooks.ibm.com/redbooks/pdfs/sg245470.pdf.

BCS742: CYBER CRIME INVESTIGATIONS AND DIGITAL FORENSICS

Credits: 3
LTP:3 0 0

Course Description: The course aims to help the students to learn the overview of cybercrime and to learn the issues ofcybercrime.

The course introduces the students and enables to know to learn the various methods to investigate cybercrime, to learn aboutdigital forensics and to understand the laws and acts behind.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:
CO1: Understand the basic terminology of cybercrimes.
CO2: Apply a number of different computer forensic tools to a given scenario.
CO3: Analyze and validate digital evidence data**.**
CO4: Analyze acquisition methods for digital evidence related to system security.
CO5: Identify the various laws and acts of Digital Forensics.

Course Content

UNIT I

Introduction: Introduction and Overview of Cyber Crime - Nature and Scope of Cyber Crime – Types of Cyber Crime:
Social Engineering - Categories of Cyber Crime - Property Cyber Crime

UNIT II

Cyber Crime Issues: Unauthorized Access to Computers - Computer Intrusions - White Collar Crimes - Viruses and Malicious Code - Internet Hacking and Cracking - Virus Attacks – Software Piracy - Intellectual Property - Mail Bombs - Exploitation - Stalking and Obscenity in Internet – Digital laws and legislation - Law Enforcement Roles and Responses

UNIT III

Investigation: Introduction to Cyber Crime Investigation -Investigation Tools – Discovery - Digital Evidence Collection -Evidence Preservation - E-Mail Investigation – Tracking - IP Tracking - E-Mail Recovery - Hands on Case Studies - Encryption and Decryption Methods - Search and Seizure of Computers - Recovering Deleted Evidences - Fake Mailer (Mail Spoof), Email Headers Forensics, End to End Encryptions, Password Cracking, Fake Mailer (Mail Spoof), Email Headers Forensics, End to End Encryptions

UNIT IV

Digital Forensics: Introduction to Digital Forensics - Forensic Software and Hardware - Analysis and Advanced Tools - Forensic Technology and Practices - Forensic Ballistics and Photography - Face, Iris and Fingerprint Recognition - AudioVideo Analysis - Windows System Forensics - Linux System Forensics - Network Forensics.

UNIT V

Laws and Acts: Laws and Ethics - Digital Evidence Controls - Evidence Handling Procedures – Basics of Indian Evidence ACT IPC and Cr PC - Electronic Communication Privacy ACT - Legal Policies.

Recommended Books / Suggested Readings:

1. Nelson Phillips and EnfingerSteuart, ―Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, ―Incident Response and Computer Forensics, TataMcGraw -Hill,New Delhi, 2006

3. Robert M Slade, ‖ Software Forensics‖, Tata McGraw - Hill, New Delhi, 2005 Bernadette H Schell, Clemens Martin, ―Cybercrime‖, ABC – CLIO Inc, California, 20043.

BTDA702: DATA WAREHOUSING AND MINING

Credits: 3
LTP:3 0 0

Course Description: The course aims to help the students to learn the overview of cybercrime and to learn the issues ofcybercrime.
The course introduces the students and enables to know to learn the various methods to investigate cybercrime, to learn aboutdigital forensics and to understand the laws and acts behind.

Course Outcomes (CO):

Upon successful completion of the course, the students should be able to:
CO1: Perform the preprocessing of data and apply mining techniques on it.
CO2: Identify the association rules, classification, and clusters in large data sets
CO3: Describe the designing of Data Warehousing so that it can be able to solve the root problems
CO4: Understand various tools of Data Mining and their techniques to solve the real time problems
CO5: Design various algorithms based on data mining tools

Course Content:

UNIT I

Data Warehousing: Overview, Definition, Data Warehousing Components, building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept.

UNIT II

Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design

UNIT III

Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction: -Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree**.**

UNIT IV

Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms.

UNIT V

Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.

Recommended Books / Suggested Readings:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, McGrawHil.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “Data Warehousing: Architecture and Implementation”, Pearson Education..
3. Singh, “Data Mining and Warehousing”, Khanna Publishing House.
4. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education.

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BTFS701: Microservices and Design Patterns

Credits: 3

LTP:3 0 0

Course Description: This course helps to determine the importance of Microservices and describe its need as an Architecture Implementation and how to be recognizing a design and they can reduce the amount of refactoring, helps to use primitive techniques such as objects, inheritance, and polymorphism.

Course Outcomes (CO):

CO1: Understand and differentiate between various Microservices Architectural Styles.

CO2: Apply Microservices Architecture principles.

CO3: Distinguish between different categories of design patterns.

CO4: Identify appropriate patterns for design of given problem.

Course Contents

UNIT,I

Introduction to Micro services: Motivation for Microservices, monolithic application, Domain Driven Design, Edge Service, SOA and Microservices, Microservices characteristic, Microservices Security, API management and gateways, the future of Microservices, Microservices Governance, Cloud Application Component Architecture.

UNIT,II

Microservices Architecture, REST Architecture principles, Microservice Characteristics, Interposes Communications, Microservice Transaction Management. Microservices Reference Architecture: Reference Architecture, Microservice Enabler, Microservices @ Netflix.

UNIT,III

Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing the Cato log, How Design Patterns solve Design Problems, How to Select a Design pattern, How to Use a Design Pattern.

UNIT,IV

Designing a Document Editor, Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look,and,Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary, Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

Suggested Reading/Textbooks Reading

1. Sam Newman," Building Microservices", O'Reilly Media.
2. Ajay Sharma, "Microservices Architecture", Kindle Edition.
3. IBM Career education Microservices Architecture and Implementation.
4. Design Patterns By Erich Gamma, Pearson Education.
5. Patterns in JAVA Vol,I (or) Vol,II By Mark Grand, Wiley Dream Tech.
6. Java Enterprise Design Patterns Vol,III By Mark Grand Wiley Dream Tech.

BTCC702: DEPLOYMENT OF MICROSERVICES

Credits: 3

LTP:3 0 0

Course Description:

This course familiar the students about the importance of Microservices and describe its need as an Architecture Implementation and helps to determine how to recognize a design and they can reduce the amount of refactoring, helps to use primitive techniques such as objects, inheritance, and polymorphism.

Course Outcomes:

On successful completion of the course students will be able to:

CO1: Understand and apply various service-oriented architectures using web service.

CO2: Describe the different web services.

CO3: Identify appropriate patterns for design of given problem.

CO4: Distinguish between different categories of design patterns.

Course Contents:

UNIT-I

Fundamentals of Service Oriented Architecture: Fundamentals of SOA, Characteristics of SOA, Principle ofSOA, Web Services Architectures and Standards, SOAP Basics, Service Description, Messaging with SOAP, UDDI Basics, REST Basics, Difference between SOAP v/s REST

UNIT-II

Web Services: Why Web services, SOA - Service Oriented Architecture, Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, how to create RESTful Services

UNIT-III

Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing the Cato log, How Design Patterns solve Design Problems, How to Select a Design pattern, How to Use a Design Pattern.

UNIT-IV

Designing a Document Editor, Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary, Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

Suggested Books/Textbooks

1. Building Microservices: Designing Fine-Grained Systems, O′Reilly
2. IBM CE - Microservices Architecture and Implementation.
3. Patterns in JAVA Vol-I (or) Vol-II By Mark Grand, Wiley Dream Tech.
4. Design Patterns by Erich Gamma, Pearson Education

BCS747: INTRUSION DETECTION SYSTEM

Credits: 3

LTP:3 0 0

Course Description: The course aims to equip the students with intrusion detection and preventionbasics and approaches.

The course includes taxonomy of anomaly detection system, architecture and justification of intrusion detection, applications and tools for intrusion detection, legal issues and organizationsstandards.

Course Outcomes (CLO):

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

CO1: Describe the intrusion detection and prevention basics and approaches.

CO2: Explain the taxonomy of anomaly detection system

CO3: Remember the architecture and justification of intrusion detection.

CO4: Apply the intrusion detection applications.

CO5: Explain the legal issues and organizations standards

CO6: Apply the intrusion detection applications.

Course Content

UNIT I

Introduction: Understanding Intrusion Detection – Intrusion detection and prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – Anomaly detection – specification based detection – Hybrid detection.

UNIT II

Theoretical Foundations of Detection: Taxonomy of anomaly detection system – Fuzzy logic – Bayes theory – Artificial Neural networks – Support vector machine – Evolutionary computation – Association rules – Clustering.

UNIT III

Architecture and Implementation: Centralized – Distributed – Cooperative Intrusion Detection - Tiered architecture - Justifying intrusion detection - Intrusion detection in security – Threat Briefing –Quantifying risk – Return on Investment (ROI).

UNIT IV

Applications and Tools: Tool Selection and Acquisition Process - Bro Intrusion Detection – PreludeIntrusion Detection - Cisco Security IDS - Snorts Intrusion Detection – NFR security

UNIT V

Legal Issues and Organizations Standards: Law Enforcement / Criminal Prosecutions – Standardof Due Care – Evidentiary Issues, Organizations and Standardization

Recommended Books / Suggested Readings:

1. Ali A. Ghorbani, Wei Lu, MahbodTavallaee, ―Network Intrusion Detection and Prevention: Conceptsand Techniques‖, Springer, 2010.
2. Carl Enrolf, Eugene Schultz, Jim Mellander, ―Intrusion detection and Prevention‖, McGraw Hill,2004.
3. Paul E. Proctor, ―The Practical Intrusion Detection Handbook ―, Prentice Hall, 2001.
4. AnkitFadia and MnuZacharia, ―Intrusion Alert‖, Vikas Publishing House Pvt., Ltd, 2007
5. Earl Carter, Jonathan Hogue, ―Intrusion Prevention Fundamentals‖, Pearson Education, 2006.

BTDA701: DATA ENGINEERING

Credits: 3
LTP:3 0 0

Course Description: The course aims to help the students to about the entire pipeline of a typical system involving data, collection, preprocessing, storage, retrieval, processing, analysis, and visualization.

Course Outcomes (CO):

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

CO1: Understand the Data Engineering Ecosystem and Data Integration Platforms
CO2: Analyse various pre-processing techniques for various datasets.
CO3: Apply retrieval techniques and Data Processing Technologies.

CO4: Apply and analyse Visualization techniques.

Course Content

UNIT I

Introduction to Data Engineering: Modern Data Ecosystem, Overview of the Data Engineering Ecosystem, Various sources, and types of data: text, video, audio, biology etc., Different Types of File Formats, Data Repositories, Data Marts, and Data Lakes ETL, ELT, and Data Pipelines, Data Integration Platforms, Big Data Processing Tools: Hadoop, HDFS, Hive, and Spark, Impact of Big Data on Data Engineering.

UNIT II

Data Preprocessing: Cleaning data, missing data imputation, noise elimination, feature selection and dimensionality reduction, normalization.

Data Storage: Database, Schema, ER diagram, SQL, functions, stored procedures, indexing B+ tree, MongoDB, Client-Server Architecture.

UNIT III

Information Retrieval: index construction, scoring models, complete search engine mechanism, evaluation methods.

Data Processing Technologies: Batch Processing: MapReduce, data parallelism, Stream Processing: Apache Kafka, Apache Flink, event-driven architectures, In-Memory Computing: Redis, Apache Ignite, Memcached.

UNIT IV

Data Analysis: regression, principal component analysis, canonical correlation analysis, analysis of variance.

Data Visualization: table, graph, histogram, pie-chart, area-plot, boxplot, scatterplot, bubble-plot, waffle charts, word clouds.

Recommended Books / Suggested Readings:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, McGraw-Hill.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “Data Warehousing: Architecture and Implementation”, Pearson Education.
3. Singh, “Data Mining and Warehousing”, Khanna Publishing House.
4. Margaret H. Dunham, S. Sridhar, “Data Mining: Introductory and Advanced Topics” Pearson Education.