B.Sc. INFORMATION TECHNOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus

Regular (2022 – 2023)

Enable | Enlighten | Enrich

KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

DEPARTMENT OF COMPUTER SCIENCE

FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)

(Established Under Section 3 of UGC Act, 1956)

(Accredited with A+ Grade by NAAC in the Second Cycle)

Eachanari (Post), Coimbatore – 641 021.
Phone No. 0422-2980011-14
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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

UNDER – GRADUATE PROGRAMMES

(REGULAR PROGRAMME)

REGULATIONS
(2022)

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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT
UNDER-GRADUATE PROGRAMMES
REGULAR MODE
REGULATIONS - 2022

The following Regulations are effective from the academic year 2022-2023 and are applicable to candidates admitted to Under Graduate Degree (UG) programmes in the Faculty of Arts, Science, Commerce and Management, Karpagam Academy of Higher Education (KAHE) from the academic year 2022-2023 onwards.

1 PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

1.1 U.G. Programmes Offered

A candidate may undergo a programme in any one of the under graduate programme approved by the KAHE as given below.

S. No.	DEGREE	DISCIPLINE
1.	B. Sc.	Biochemistry
2.	B. Sc.	Biotechnology
3.	B. Sc.	Computer Science
4.	B.Sc.	Mathematics
5.	B.Sc.	Physics
6.	B. Sc.	Chemistry
7.	B. Sc.	Microbiology
8.	B. Sc.	Information Technology
9.	B. Sc.	Computer Technology
10.	B.Sc.	Computer Science (Cognitive Systems)
11.	B.Sc.	Computer Science (Artificial Intelligence and Data Science)
12.	BCA	Computer Application
13.	B.Sc.	Applied Science (Material Science)
14.	B.Sc.	Applied Science (Foundry Science)
15.	B. Com.	Commerce
16.	B.Com (CA)	Commerce with Computer Applications
17.	B. Com. (PA)	Commerce with Professional Accounting
18.	B. Com. (BPS)	Commerce with Business Process Services

19.	B.B.A.	Business Administration
20.	B. Com	Financial Analytics
21.	B. Com	International Accounting and Finance

1.2 Mode of Study

Full-Time
All programs are offered under Full-Time Regular mode. Candidates admitted under '**Full-Time**' should be present in the KAHE during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

1.3 Admission Requirements (Eligibility)

A candidate for admission to the first year of the UG Degree programme shall be required to have passed the Higher Secondary Examination (10 + 2) [Academic or Vocational] prescribed by the Government of Tamil Nadu Board or any similar examination of any other Board accepted by the KAHE as equivalent thereto. (Annexure I)

2. DURATION OF THE PROGRAMMES

2.1 The minimum and maximum period for the completion of the U.G. Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
B.Sc., B.Com, BCA, BBA	6	12

2.2 Each semester normally consists of 90 working days or 450 Instructional hours of study. Examination shall be conducted at the end of every semester for the respective courses.

3. CHOICE BASED CREDIT SYSTEM

3.1. All programmes are offered under Choice Based Credit System with a total credit of 144 for UG Programme.

3.2. Credits
Credit means the weightage given to each course by the experts of the Board of Studies concerned. Total credits 144 as per UGC Guidelines for the UG programme (Three Years).

4. STRUCTURE OF THE PROGRAMME

4.1 Tamil or any one of the Indian / Foreign Languages *viz,* Malayalam, Hindi, Sanskrit, French is offered as an additional course for Arts &

Science Programmes. 4 credits are awarded for each course and the examinations will be conducted at the end of each semester.

4.2. Core Course, Discipline Specific Elective, Generic Elective, Skill Enhancement Course, Project, Ability Enhancement Course are part of curricular structure.

4.2.1. Core Course

Core course consists of theory and practical for Department domains for which examinations shall be conducted at the end of each semester. The students have to study 21 Core Courses compulsorily. Students have to earn 65 Credits in Core Course.

4.2.2. Discipline Specific Electives (DSE)

DSE is offered in the fifth and sixth semesters of third year. The examination shall be conducted at the end of each semester. Final year students (V and VI Semesters) will have to choose the elective courses in V semester and VI Semester from the list of elective courses given in the curriculum, in addition to the project work. Students have to earn 24 Credits in Discipline Specific Electives.

4.2.3. Generic Elective

Generic elective is an elective course chosen generally from an unrelated discipline/subject, with an intention to provide exposure in other areas of interest also to students.

The students have to choose two Generic Electives- one each in the First year (3 or 4 courses) and second year (3 or 4 courses) of the programme from the list of elective courses given in the curriculum.

Note: A particular elective course will be offered only if at least one third of the students in a class choose that course. If less, the elective selected has to be studied as a self-study course only. Students have to earn 19 Credits in Generic Elective and 20 Credits in Allied Courses.

4.2.4. Skill Enhancement Courses

Skill Enhancement Courses are offered in the third and fourth semesters of second year programme and in the fifth and sixth semesters of the third-year programme. Second year students (III and IV Semesters) will have to choose atleast one elective course each in both III and IV Semesters from the list of elective courses given in the curriculum. Similarly final year students (V and VI Semesters) will have to choose at least one elective course each in both V and VI Semesters from the list of elective courses given in the curriculum. The examination shall be conducted at the end of each semester. Students have to earn 16 Credits in Skill Enhancement Courses.

Note: A particular elective course will be offered only if at least one third of the students in a class choose that course. If less, the elective selected has to be studied as a self-study course only.

4.2.5. Project Work

The project work shall start at the beginning of sixth semester and the Project Report has to be submitted at the end of the sixth semester. The project may be an individual or group task. The Head of Department concerned shall assign a project supervisor who in turn shall monitor the project work of the student(s). A project/ dissertation work may be given *in lieu* of a discipline-specific elective paper. Maximum number of students per project batch is 2.

4.2.6. Ability Enhancement Course

Ability Enhancement Course-1

The course (English I & II for Science Programmes / Communicative English I & II for Arts Programmes) shall be offered during the first and second semester for which examinations shall be conducted at the end of the semester. Four credits are awarded for each course and the examinations will be conducted at the end of each semester.

Ability Enhancement Compulsory Course-2

Students shall study the course Environmental Studies in the First / Second Semester for which examinations shall be conducted at the end of the semester.

4.2.7. Internship

The student shall undergo 15 days internship in the end of II and IV semester. Internship report will be evaluated by Continuous Internal Assessment mode and awarded in the III and V semester respectively. Students have to earn 2 credits each for the Internships and 100 marks each is awarded for each Internship.

4.2.8. Soft Skill Development - I

The course Soft Skill Development - I shall be offered during the third semester for which examinations shall be conducted at the end of the semester and 100 marks is awarded through Continuous Internal Assessment. Students have to earn 1 credit for this course.

Soft Skill Development - II

The course Soft Skill Development - I shall be offered during the

fourth semester for which examinations shall be conducted at the end of the semester and 100 marks is awarded through Continuous Internal Assessment. Students have to earn 1 credit for this course.

Open Elective Course

He / She may select one of the open elective courses from the list given below offered by the other Departments in the fifth semester. Students have to earn 2 credits for this course. (The student cannot select a course offered by the parent department).

S.No	Name of the Department	Course Code	Name of the Course
1	B Com	22CMUOE501	Business Accounting
2	B Com Financial Analytics	22FAUOE501	Business Accounting
3	B Com Commerce with Computer Applications	22CCUOE501	Enterprise Resource Planning
4	B Com Commerce with Professional Accounting	22PAUOE501	Basics of Accounting
5	B Com Commerce with Business Process Services	22BPUOE501	Basics of Accounting
6	B Com International Accounting and Finance	22AFUOE501	Enterprise Resource Planning
7	BBA	22BAUOE501	Principles of Management
8	B.Sc Computer Science	22CSUOE501	Data Visualization
9	BCA	22CAUOE501	Animation Techniques
10	B.Sc Information Technology	22ITUOE501	Multimedia and its Applications
11	B.Sc Computer Technology	22CTUOE501	Multimedia and its Applications
12	B.Sc	22CGUOE501	Web Designing

	Computer Science (Cognitive Systems)		
13	B.Sc Computer Science (Artificial Intelligence and Data Science)	22ADUOE501	E-Commerce Technologies
14	B.Sc Mathematics	22MMUOE501	Combinatorics
15	B.Sc Physics	22PHUOE501	Atmosphere and Weather
16	B.Sc Chemistry	22CHUOE501	Dairy Chemistry
17	B.Sc Microbiology	22MBUOE501	Bio Nanotechnology
18	B.Sc Biochemistry	22BCUOE501	Hygiene and Health
19	B.Sc Biotechnology	22BTUOE501	Golden Manure Preparation

5.0 Value Added Courses

Courses of varying durations but not less than 30 hours which are optional and offered outside the curriculum that add value and help the students for getting placement. Students of all programmes are eligible to enroll for the value-added courses. The student can choose one Value-added course per semester from the list of Value-added courses available in KAHE. The examinations shall be conducted at the end of the value-added course at the Department level and the student has to secure a minimum of 50% of marks to get a pass. The certificate for the value-added course for the passed students shall be issued duly signed by the HOD and Dean of the Faculty concerned.

6.0 Online Course

Student shall study at least one online course from SWAYAM / NPTEL / MOOC in any one of the first five semesters for which examination shall be conducted at the end of the course by the respective external agencies if any. The student can register to the courses which are approved by the Department. The student shall produce a Pass Certificate from the respective agencies before the end of the fifth semester. The credit(s) earned by the students will be considered as additional credit(s) over and above the credits minimum required to earn a particular degree.

7.0 Extension Activities

Every student is encouraged to participate in at least any one of the following Extension activities:

- NSS

- NCC

- Sports / Mass drill
- YRC
- Club activities
- Other Co-curricular and Extra curricular activities

The student's performance shall be examined by the staff in-charge of Extension Activities along with the faculty mentor and the Head of the respective department on the following parameters.

- 75 % weightage for active participation in Extension Activities in / out of the KAHE.
- 25 % weightage for Exemplary Awards / Honours / Prizes secured.

8.0 Marks for Co-curricular and Extra-curricular shall be sent to the CoE before the commencement of the Sixth End Semester Examinations. The above activities shall be conducted outside the regular working hours of the KAHE.

5. MEDIUM OF INSTRUCTION

The medium of instruction and examinations for the courses under Language I – Tamil / Hindi / Malayalam / French / Sanskrit shall be in the language concerned. For all other courses, the medium of instruction and examination should be in English.

6. MAXIMUM MARKS

Each of the theory and practical courses shall carry a maximum of 100 marks. Out of which 40 marks is awarded for Continuous Internal Assessment (CIA) and 60 marks for End Semester Examinations (ESE).

Evaluation: Evaluation in the courses comprises two parts, one is the Continuous Internal Assessment (CIA) and the other one is the End Semester Examination (ESE).

7. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

a. Ideally, every student is expected to attend all classes and should secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

b. A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National /

International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed minimum attendance requirements and shall be permitted to appear for the examination on the recommendation of the Head of Department concerned and Dean to condone the shortage of attendance. The Head of Department has to verify and certify the genuineness of the case before recommending to the Dean concerned. However, the candidate has to pay the prescribed condonation fee to the KAHE.

c. However, a candidate who has secured attendance less than 64% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for his/her supplementary examinations, if any and he/she has to re-do the same semester with the approval of the "Students' Affairs Committee" and Registrar.

8. **a. FACULTY MENTOR**
   To help students in planning their courses of study and for general advice on the academic programme, the HoD shall allot twenty students to a faculty who will function as faculty mentor throughout their period of study. Faculty mentor shall advise the students and monitor their behavior and academic performance. Problems if any shall be counseled by them periodically. The faculty mentor is also responsible to inform the parents of their wards' progress. Faculty mentor shall display the cumulative attendance particulars of his / her ward students' periodically (once in 2 weeks) on the Notice Board to enable the students, know their attendance status and satisfy the **clause 7** of this regulation.

   b. **ONLINE COURSE COORDINATOR**
   To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinators shall advice the students regarding the online courses and monitor their course.

9. **CLASS COMMITTEE**
   Every class shall have a Class Committee consisting of the faculty members of the various courses of the class concerned, student representatives (Minimum 2 boys and 2 girls of various capabilities and Maximum of 6 members) and the concerned HoD / senior faculty as Chairperson. The objective of the Class Committee Meeting is all about

the teaching – learning process. Class Committee shall be convened at least once in a month. The functions of the Class Committee shall include

- Analyzing and solving problems experienced by students in the class room and in the laboratories.
- Analyzing the performance of the students of the class after each test and finding the ways and means to improve the performance.
- The Class Committee of a particular class of any department is normally constituted by the HoD / Chairperson of the Class Committee. However, if the students of different departments are mixed in a class, the Class Committee shall be constituted by the respective Dean of the Faculty.
- The class committee shall be constituted during the first week of each semester.
- The HoD / Chairperson of the Class committee is authorized to convene the meeting of the class committee.
- The respective Dean of the Faculty has the right to participate in any Class committee meeting.
- The Chairperson is required to prepare the minutes of every meeting, and submit the same to Dean concerned within two days after having convened the meeting. Serious issues if any shall be brought to the notice of the Registrar by the HoD / Chairperson immediately.

10. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or department shall have a "Course Committee" comprising all the teachers handling the common course with one of them nominated as Course Coordinator. The nomination of the course coordinator shall be made by the respective Dean depending upon whether all the teachers handling the common course belong to a single department or to various other departments. The 'Course Committee' shall meet in order to arrive at a common scheme of evaluation for the tests to ensure a uniform evaluation of the tests. If feasible, the course committee shall prepare a common question paper for the Internal Assessment test(s). Course Committee Meeting is conducted once in a semester.

11. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

11.1 **Attendance and assessment:** Every Faculty is required to maintain an **Attendance and Assessment Record (Log book)** which consists of attendance of students marked for each lecture / practical /

project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the HoD once in a fortnight for checking the syllabus coverage and the records of test marks and attendance. The HoD shall sign with date after due verification. The same shall be submitted to respective Dean once in a month. After the completion of the semester the HoD should keep this record in safe custody for five years. Because records of attendance and assessment shall be submitted for Inspection as and when required by the KAHE / any other approved body.

11.2 **Continuous Internal Assessment (CIA)**: The performance of students in each course will be continuously assessed by the respective faculty as per the guidelines given below:

Theory Courses

S. No.	Category	Maximum Marks
1.	Assignment*	5
2.	Attendance	5
3	Seminar	5
4.	Test – I (1 ½ units- Unit I and II)	8
5	Test – II (1 ½ units Unit II and III)	8
6	Test III (2 units Unit IV and V)	9
Continuous Internal Assessment: Total		40

* Two Assignments (Assignment I before Internal Test – I and assignment II before Internal Test – II).

Practical Courses

S. No.	Category	Maximum Marks
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	20
5.	*Viva – voce* [Comprehensive]*	5
Continuous Internal Assessment: Total		**40**

*

Includes *Viva- voce* conducted during the model Exam practical.

Every practical Exercise / Experiment shall be evaluated based on the conduct of Exercise/ Experiment and records maintained.

11.3 Pattern of Test Question Paper

Portions for Internal Test – I   : First 1 ½ Units(Unit I and II)

Portions for Internal Test – II   : Second 1 ½ Units (Unit II and III)

Portions for Internal Test – III : Two units (Unit IV and V)

Instruction	Remarks
Maximum Marks	50 marks
Duration	2 Hours
Part – A	Objective type (20*1=20)
Part - B	Short Answer Type (3*2 = 6)
Part - C	3 Eight mark questions 'either – or' choice (3*8 = 24 Marks)

11.4 Attendance

Marks Distribution for Attendance

S. No.	Attendance (%)	Maximum Marks
1	91 and above	5.0
2	81 - 90	4.0
3	76 - 80	3.0
4	Less than 75	0

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12. ESE EXAMINATIONS

12.1 End Semester Examination (ESE): End Semester Examination will be held at the end of each semester for each course. The question paper is for a maximum 60 marks.

Pattern of ESE Question Paper:

Instruction	Remarks
Maximum Marks	60 marks for ESE.
Duration	3 hours (½ Hr for Part – A Online & 2 ½ Hours for Part – B and C
Part - A	20 Questions of 1 mark each (20 * 1 = 20 Marks) Question No. 1 to 20 Online Multiple-Choice Questions
Part- B	5 Questions of 2 marks each (5 * 2 = 10 Marks) Covering all the five units of the syllabus Question No. 21 to 25
Part- C	5 six marks Questions of 6 marks each (5 * 6 = 30 Marks.) Question No. 26 to 30 will be 'either-or' type, covering all five units of the syllabus; i.e., Question No. 26: Unit - I, either 26 (a) or 26 (b), Question No. 27: Unit - II, either 27 (a) or 27 (b), Question No. 28: Unit - III, either 28 (a) or 28 (b), Question No. 29: Unit - IV, either 29 (a) or 29 (b), Question No. 30: Unit - V, either 30 (a) or 30 (b)

12.2 **Practical:** There shall be combined valuation. The pattern of distribution of marks shall be as given below.

Experiments	: 40 Marks
Record	: 10 Marks
Viva-voce	: 10 Marks
Total	**: 60 Marks**

Record Notebooks for Practical Examination
Candidate taking the practical examination should submit Bonafide Record Notebook prescribed for the practical examination; failing which the candidate will not be permitted to take the practical examination.

In case of failures in Practical Examination, the marks awarded for the Record at the time of first appearance of the Practical Examination shall remain the same at the subsequent appearance also by the candidate.

12.3. Evaluation of Project Work

12.3.1 The project work shall carry a maximum of 100 marks. (CIA - 40 and ESE – 60*)

*Combined valuation of Internal and External Examiners.

12.3.2 The project report prepared according to the approved guidelines and duly signed by the supervisor(s) shall be submitted to HoD.

12.3.3 The evaluation of the project will be based on the project report submitted and a *viva-voce* Examination by a team consisting of the supervisor, who will be the Internal Examiner and an External Examiner who shall be appointed by the COE. In case the guide is not available, the HoD shall act as an Internal Examiner for the same.

12.3.4 If a candidate fails to submit the project report on or before the specified date given by the Examination Section, the candidate is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester.

If a candidate fails in the respective viva-voce examinations he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. For this purpose, the same Internal and External examiner shall evaluate the resubmitted report.

12.3.5 Copy of the approved project report after the successful completion of *viva-voce* examination shall be kept in the KAHE library.

13. PASSING REQUIREMENTS

13.1 Passing minimum: There is a passing minimum 20 marks out of 40 marks for CIA and the passing minimum is 30 marks out of 60 marks in ESE. The overall passing in each course is 50 out of 100 marks (Sum of the marks in CIA and ESE examination).

13.2 If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 13.1, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till, he / she receives a pass both in CIA and ESE (vide Clause 2.1).

13.3 Candidate failed in CIA will be permitted to improve CIA marks in the subsequent semesters by writing tests and by re-submitting Assignments.

13.4 CIA marks (if it is pass) obtained by the candidate in the first appearance shall be retained by the Office of the Controller of Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE

13.5 Candidate who is absent in ESE in a Course / Practical / Project Work after having enrolled for the same shall be considered to have **failed** in that examination.

14. IMPROVEMENT OF MARKS IN THE COURSES ALREADY PASSED

Candidates desirous to improve the marks secured in a passed course in their first attempt shall reappear once (**only in ESE**) in the subsequent semester. **The improved marks shall be considered for classification but not for ranking.** If there is no improvement there shall be no change in the marks awarded earlier.

15. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

Letter grade	Marks Range	Grade Point	Description
O	91 - 100	10	OUTSTANDING
A+	81- 90	9	EXCELLENT
A	71-80	8	VERY GOOD
B+	66- 70	7	GOOD
B	61 – 65	6	ABOVE AVERAGE
C	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	<50	-	REAPPEARANCE
AAA	-	-	ABSENT

16. GRADE SHEET

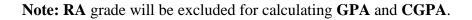After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:

i.   The list of courses enrolled during the semester and the grade scored.

ii.   The Grade Point Average (**GPA**) for the semester and

iii.   The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

iv.   Remark on Extension Activities (only in the 6th Semester Grade Sheet)

GPA of a Semester and CGPA of a programme will be calculated as follows.

$$\textbf{GPA of a Semester} = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that Semester}}{\text{Sum of the credits of the courses of that Semester}}$$

i.e. $$\textbf{GPA of a Semester} = \frac{\sum_i C_i GP_i}{\sum_i C_i}$$

$$\textbf{CGPA of the entire programme} = \frac{\text{Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

i.e. $$\textbf{CGPA of the entire programme} = \frac{\sum_n \sum_i C_{ni} GP_{ni}}{\sum_n \sum_i C_{ni}}$$

where,

C_i is the credit fixed for the course 'i' in any semester

GP_i is the grade point obtained for the course 'i' in any semester

'n' refers to the Semester in which such courses are credited.

Note: RA grade will be excluded for calculating **GPA** and **CGPA**.

17. REVALUATION

A candidate can apply for revaluation and re-totaling of his / her semester examination answer script (**theory courses only**), within 2 weeks from the date of declaration of results, on payment of a prescribed fee. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the HoD concerned**.** Revaluation is not permitted for supplementary theory courses.

18. TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling is allowed on representation (clause 17). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wishes. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the KAHE), The HoD of Department concerned, the faculty of the course and Dean from other discipline nominated by the KAHE and the CoE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

19. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the conferment of the Degree if he / she has

- Successfully completed all the components prescribed under Part I to Part IV in the CBCS pattern to earn the minimum required credits as specified in the curriculum corresponding to his / her programme within the stipulated period vide class 2.1.
- Not any disciplinary action pending against him / her.
- The award of the degree must be approved by the Board of Management.

20. CLASSIFICATION OF THE DEGREE AWARDED

20.1 Candidate who qualifies for the award of the Degree (vide clause 19) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8** shall be declared to have passed the examination in the **First Class with Distinction.**

20.2 Candidate who qualifies for the award of the Degree (vide clause 19) having passed the examination in all the courses within the specified maximum number of semesters (vide clause 2.1), securing a **CGPA not less than 6.5** shall be declared to have passed the examination in the **First Class**.

20.3 All other candidates (not covered in clauses 20.1 and 20.2) who qualify for the award of the degree (vide Clause 19) shall be declared to have passed the examination in the **Second Class**.

21. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

21.1 Candidate due to valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

21.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

21.3 Withdrawal of application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the HoD / Dean concerned and approved by the Registrar.

21.3.1 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

21.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during **VI semester**.

21.5 Withdrawal from the End semester examination is **NOT** applicable to arrears courses of previous semesters.

21.6 The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

22. PROVISION FOR AUTHORISED BREAK OF STUDY

22.1 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme**.** However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for

valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department stating the reasons therefore and the probable date of rejoining the programme.

22.2 The candidate thus permitted to rejoin the Programme after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the Regulations in force at that period of time.

22.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide Clause 20). However, additional break of study granted will be counted for the purpose of classification.

22.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2.1 irrespective of the period of break of study (vide clause 22.1) in order that he/she may be eligible for the award of the degree.

22.5 If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' or 'Withdrawal' (Clause 21 and 22) is not applicable for this case.

23. RANKING

A candidate who qualifies for the UG Degree programme passing all the Examinations in the first attempt, within the minimum period prescribed for the programme of study from Semester I through Semester VI to the programme shall be eligible for ranking. Such ranking will be confined to 10% of the total number of candidates qualified in that particular programme of study subject to a maximum of 10 ranks.

24. SUPPLEMENTARY EXAMINATION

Supplementary Examination will be conducted only for the final semester students within ten days from the date of publication of results for students who have failed in one theory course only. Such students shall apply with prescribed fee to the Controller of Examinations within the stipulated time.

25. DISCIPLINE

25.1. If a student indulges in malpractice in any of the Internal / External Examinations he / she shall be liable for punitive action as prescribed by the KAHE from time to time.

25.2. Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the KAHE. The erring students will be referred to the disciplinary committee constituted by the KAHE, to enquire into acts of indiscipline and recommend the disciplinary action to be taken.

26. REVISION OF REGULATION AND CURRICULUM

Karpagam Academy of Higher Education may from time-to-time revise, amend or change the Regulations, Scheme of Examinations and syllabi if found necessary.

Annexure I

S.No	Programme	Subject	Eligibility
1	B. Sc.	Biochemistry	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Biology or Botany or Zoology or chemistry as subjects at the Higher Secondary level.
2	B. Sc.	Biotechnology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Biology or Botany or Zoology as subjects at the Higher Secondary level.
3	B. Sc.	Computer Science	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3-year diploma after 10th or 10+2 pattern of education taking computer science/maths as one of the subject.
4	B.Sc.	Mathematics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Mathematics /statistics as subjects at the Higher Secondary level. (OR) 3 year diploma after 10th or 10+2 pattern of education taking maths as one of the subject.
5	B.Sc.	Physics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Physics as one of the subjects at the Higher Secondary level (OR) 3 year diploma after 10th or 10+2 pattern of education taking physics as one of the subject.
6	B. Sc.	Chemistry	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Chemistry as one of the subjects at the Higher Secondary level.
7	B. Sc.	Microbiology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or

			Board under the 10+2 pattern taking Biology or Botany or Zoology as subjects at the Higher Secondary level.
8	B. Sc.	Information Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10th or 10+2 pattern of education taking computer science/maths as one of the subject.
9	B. Sc.	Computer Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10th or 10+2 pattern of education taking computer science/maths as one of the subject.
10	B.Sc.	Computer Science(Cognitive Systems)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3-year diploma after 10th or 10+2 pattern of education taking computer science/maths as one of the subject.
11	B.Sc.	Computer Science (Artificial Intelligence and Data Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10th or 10+2 pattern of education taking computer science/maths as one of the subject.
12	BCA	Computer Application	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
13	B.Sc.	Applied Science (Material Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Physics as one of the subjects at the Higher Secondary level (OR) 3 year diploma after 10th or 10+2 pattern of education taking the respective subject as one of the subject.

14	B.Sc.	Applied Science (Foundary Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Physics as one of the subjects at the Higher Secondary level (OR) 3 year diploma after 10th or 10+2 pattern of education taking the respective subject as one of the subject.
15	B. Com.	Commerce	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
16	B.Com (CA)	Commerce with Computer Applications	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern.
17	B. Com. (PA)	Commerce with Professional Accounting	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
18	B. Com. (BPS)	Commerce with Business Process Services	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
19	B.B.A.	Business Administration	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
20	B. Com	Financial Analytics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .
21	B. Com	International Accounting and Finance	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern .

PROGRAMME OUTCOMES: The programmme must enable students to attain by the time of graduation

a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

c) An ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs.

d) An ability to function effectively on teams to accomplish a common goal

e) An understanding of professional, ethical, legal, security and social issues and responsibilities

f) An ability to communicate effectively with a range of audiences

g) An ability to use current techniques, skills and tools necessary for computing practice

h) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking and web systems and technologies

i) An ability to effectively integrate IT-based solutions into the user environment

j) An understanding of best practices and standards and their application

PROGRAMMME SPECIFIC OUTCOME (PSOs)

k) Understand analyze and develop computer programs in the areas related to Database systems and Big data Analytics, cloud computing, soft computing, IoT, Image processing, Green computing, web designing, mobile computing and networking for efficient design of computer-based system of varying complexity.

l) Apply standard software Engineering practices and strategies in software project development using open-source programming environment to deliver a quality for business success.

m) Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems.

n) An ability to produce cost effective, quality and maintainable software products and solutions (services) meeting the global standards and requirements with the knowledge acquired and using the emerging techniques, tools and software engineering methodologies and principles and able to comprehend and write effective project reports in multidisciplinary environment in the context of changing technologies.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I : To be a working Information Technology (IT) professional with core competencies that can be used on multi-disciplinary projects

PEO II : To understand the importance of relationship building within the IT industry

PEO III : To understand the need for lifelong learning in the exploration and journey in IT

PEO IV : To understand, evaluate and practice ethical behavior within the IT industry

PEO V : To be cognizant of security issues and their impacts on industry

MAPPING of PEOs and POs

POs	a	b	c	d	e	f	g	h	i	j	k	l	m	n
PEO I	X	X	X				X	X	X	X	X		X	
PEO II	X	X	X				X	X	X	X				X
PEO III	X	X	X				X	X					X	
PEO IV				X	X	X								X
PEO V	X	X	X				X	X		X			X	

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT
UG PROGRAM (CBCS) – B.Sc. Information Technology
(2022–2023 Batch and onwards)

Course code	Name of the course	Objectives and out comes PEOs	Objectives and out comes POs	Instruction hours / week L	Instruction hours / week T	Instruction hours / week P	Credit(s)	Maximum Marks CIA 40	Maximum Marks ESE 60	Maximum Marks Total 100	Category	Page No
SEMESTER - I												
22LSU101	Language – I	IV	d,e,f	4	-	-	4	40	60	100	AEC	1
22ENU101	English - I	II	d,e,f	4	-	-	4	40	60	100	AEC	4
22ITU101	Problem Solving Techniques	II	a,b,c	4			4	40	60	100	Core	6
22ITU102	Object Oriented Programming Using C++	I	a,b,c	4	-	-	4	40	60	100	Core	8
22ITU103	Numerical Methods	I	h,j	4	-	-	4	40	60	100	Allied	10
22ITU111	Office Automation-Practical	I	a,g	-	-	3	2	40	60	100	Core	12
22ITU112	Object Oriented Programming Using C++-Practical	I	a,b,c,g	-	-	4	2	40	60	100	Core	14
22ITU113	Numerical Methods-Practical	I	a,b,c,g	-	-	3	2	40	60	100	Allied	16
	Semester Total			**20**	**-**	**10**	**26**	**320**	**480**	**800**		
SEMESTER – II												
22LSU201	Language – II	IV	d,e,f	4	-	-	4	40	60	100	AEC	18
22ENU201	English - II	II	d,e,f	4	-	-	4	40	60	100	AEC	21
22ITU201	Programming in Java	I	a,b,c	6	-	-	6	40	60	100	Core	23
22ITU202	Discrete Structures	I	h,j	5	-	-	5	40	60	100	Allied	26
22ITU211	Programming in Java-Practical	I	a,b,c,g	-	-	4	2	40	60	100	Core	28
22ITU212	Discrete Structures-Practical	III	a,b,c,g	-	-	4	2	40	60	100	Allied	30
22AEC201	Environmental Studies	IV	e	3	-	-	3	40	60	100	AEC	32
	Semester Total			**22**		**8**	**26**	**280**	**420**	**700**		
SEMESTER – III												
22ITU301	Data Structures	I	a,b,h	4	-	-	4	40	60	100	Core	35
22ITU302	Relational Database Management Systems	II	a,b,c	4	-	-	4	40	60	100	Core	37
22ITU303	Digital Computer Fundamentals	II	a,b,c	4	-	-	3	40	60	100	Allied	39
22ITU304A	Programming in Python	I	a,b,c	3	-	-	3	40	60	100	SEC	41
22ITU304B	Scripting Language											43
22ITU311	Data Structures-Practical	II	b,h,j	-	-	4	2	40	60	100	Core	45
22ITU312	Relational Database Management Systems-Practical	I	a,b,c,g	-	-	3	2	40	60	100	Core	47
22ITU313	Web Designing - Practical	I	a,b,c,h	-	-	3	2	40	60	100	Core	52
22ITU314A	Programming in Python-Practical	I	a,b,c,g	-	-	3	1	40	60	100	SEC	54
22ITU314B	Scripting Language-Practical											56
22SSD301	Soft Skill Development - I	I	a,i,j	2	-	-	1	100	-	100	SEC	58
22ITU391	Internship *	II	a,b,c,j		-	-	2	100	-	100	SEC	60
	Semester Total			**17**		**13**	**24**	**520**	**480**	**1000**		

SEMESTER – IV												
22ITU401	Operating Systems	V	b,c,g	4	-	-	4	40	60	100	Core	61
22ITU402	Software Engineering	II	a,b,c,d	4	-	-	4	40	60	100	Core	63
22ITU403	Operations Research	I	h,j	4	-	-	4	40	60	100	Allied	65
22ITU404A	.Net Programming	I	a,b,c,g	3	-	-	3	40	60	100	SEC	67
22ITU404B	Android Programming											69
22ITU411	Operating Systems-Practical	V	a,b,c,g	-	-	3	2	40	60	100	Core	71
22ITU412	Software Engineering-Practical	II	b,h,i,j	-	-	4	2	40	60	100	Core	73
22ITU413	Multimedia Tools-Practical	I	b,h,i,j	-	-	3	1	40	60	100	Core	75
22ITU414A	.Net Programming-Practical	I		-	-	3	1	40	60	100	SEC	77
22ITU414B	Android Programming-Practical		b,h,i,j									79
22SSD401	Soft Skill Development - II	I	a,i,j	2	-	-	1	100	-	100	SEC	81
	Semester Total			**17**		**13**	**22**	**420**	**480**	**900**		
SEMESTER – V												
22ITU501	Computer Networks	V	a,b,c	4	-	-	4	40	60	100	Core	83
22ITU502A	PHP Programming	I	a,b,c	4	-	-	4	40	60	100	DSE	85
22ITU502B	Full Stack Web Development											87
22ITU503A	R Programming	III	a,b,c	4	-	-	4	40	60	100	DSE	89
22ITU503B	Programming in MATLAB											91
22ITU504A	Data Mining	I	a,b,c	3	-	-	3	40	60	100	DSE	93
22ITU504B	Machine Learning											95
22ITU511	Computer Networks-Practical	V	a,b,c,h	-	-	3	2	40	60	100	Core	97
22ITU512A	PHP Programming-Practical	V	a,b,c,g	-	-	3	1	40	60	100	DSE	99
22ITU512B	Full Stack Web Development-Practical											101
22ITU513A	R Programming-Practical	III	a,b,c,g			3	1	40	60	100	DSE	103
22ITU513B	Programming in MATLAB-Practical			-	-							105
22ITU514A	Data Mining-Practical	I	a,b,c,g			3	1	40	60	100	DSE	108
22ITU514B	Machine Learning-Practical			-	-							110
22ITUOE501	Open Elective - **Multimedia and its Applications**	I, V	a,b,c	3	-	-	2	40	60	100	SEC	112
22ITU591	Internship *	II	a,b,c,j		-	-	2	100	-	100	SEC	114
	Semester Total			**18**		**12**	**24**	**460**	**540**	**1000**		
SEMESTER – VI												
22ITU601	Artificial Intelligence	I	b,c,g	4	-	-	4	40	60	100	Core	115
22ITU602A	System Programming	II	b,c,g	4	-	-	4	40	60	100	DSE	117
22ITU602B	Compiler Design											119
22ITU603A	Big Data Analytics	II	b,c,g	3			3	40	60	100	DSE	121
22ITU603B	Data Science											123
22ITU611	Artificial Intelligence-Practical	II	a,b,c,g	-	-	4	2	40	60	100	Core	125
22ITU612A	System Programming-Practical	II	b,c,h,i			4	2	40	60	100	DSE	127
22ITU612B	Compiler Design-Practical			-	-							129
22ITU613A	Big Data Analytics-Practical	II	b,c,h,i			3	1	40	60	100	DSE	131
22ITU613B	Data Science-Practical			--	--							133
22ITU691	Project	III	a,b,c,g	-	-	8	6	40	60	100	Core	135
ECA/NCC/NSS/Sports/General Interest etc		--	--	--	--	--	--	--	--	--		
	Semester Total			**11**	**-**	**19**	**22**	**280**	**420**	**700**		
	Programme Total			**105**	**-**	**75**	**144**	**2280**	**2820**	**5100**		

** The color indicates
* Entrepreneur Oriented Courses - Green
* Employability Oriented Courses- Blue
* Skill Development Oriented Courses- Red

Ability Enhancement Courses (AEC)	
Course Code	**Name of the Course**
22LSU101	Language – I
22ENU101	English-I
22LSU201	Language – II
22ENU201	English –II
22AEC201	Environmental Studies

Allied Courses		
Semester	**Course Code**	**Name of the Course**
I	22ITU103	Numerical Methods
	22ITU113	Numerical Methods-Practical
II	22ITU202	Discrete Structures
	22ITU212	Discrete Structures-Practical
III	22ITU303	Digital Computer Fundamentals
IV	22ITU403	Operations Research

SKILL ENHANCEMENT COURSE (SEC)		
Semester	**Course Code**	**Name of the Course**
III	22ITU304A	Programming in Python
	22ITU304B	Scripting Language
	22ITU314A	Programming in Python-Practical
	22ITU314B	Scripting Language-Practical
	22SSD301	Soft Skill Development - I
IV	22ITU404A	.Net Programming
	22ITU404B	Android Programming
	22ITU414A	.Net Programming-Practical
	22ITU414B	Android Programming-Practical
	22SSD401	Soft Skill Development - II
	22ITU491	Internship
V	22ITUOE501	Open Elective -Multimedia and its Applications
	22ITU591	Internship

DISCIPLINE SPECIFIC ELECTIVE (DSE)		
Semester	Course Code	Name of the Course
V	22ITU502A	PHP Programming
	22ITU502B	Full Stack Web Development
	22ITU503A	R Programming
	22ITU503B	Programming in MATLAB
	22ITU504A	Data Mining
	22ITU504B	Machine Learning
	22ITU512A	PHP Programming-Practical
	22ITU512B	Full Stack Web Development-Practical
	22ITU513A	R Programming-Practical
	22ITU513B	Programming in MATLAB -Practical
	22ITU514A	Data Mining-Practical
	22ITU514B	Machine Learning-Practical
VI	22ITU602A	System Programming
	22ITU602B	Compiler Design
	22ITU603A	Big Data Analytics
	22ITU603B	Data Science
	22ITU612A	System Programming-Practical
	22ITU612B	Compiler Design-Practical
	22ITU613A	Big Data Analytics-Practical
	22ITU613B	Data Science-Practical

CORE COURSES (CC)		
Semester	Course Code	Name of the Course
I	22ITU101	Problem Solving Techniques
	22ITU102	Object Oriented Programming Using C++
	22ITU111	Office Automation-Practical
	22ITU112	Object Oriented Programming Using C++-Practical
II	22ITU201	Programming in Java
	22ITU211	Programming in Java-Practical
III	22ITU301	Data Structures
	22ITU302	Relational Database Management Systems
	22ITU311	Data Structures-Practical
	22ITU312	Relational Database Management Systems-Practical
	22ITU313	Web Designing - Practical
IV	22ITU401	Operating Systems
	22ITU402	Software Engineering
	22ITU411	Operating Systems-Practical
	22ITU412	Software Engineering-Practical
	22ITU413	Multimedia Tools-Practical
V	22ITU501	Computer Networks
	22ITU511	Computer Networks -Practical
VI	22ITU601	Artificial Intelligence
	22ITU611	Artificial Intelligence-Practical
	22ITU691	Project

Course Distribution Table

Category	No. of Courses		Total
	Theory	**Practical**	
Core	9	11	20
AECC	5	0	5
Allied	4	2	6
SEC	7	6	13
DSE	10	10	20
Project	0	1	1
Total	35	30	65

Course Distribution

Core 20
AECC 5
Allied 6
SEC 13
DSE 20
Project 1

Semester – I

22LSU101   **Language – I**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

பாடத்திட்டப் பொதுநோக்கம்
- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு
1. இந்திய குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில், விருப்பப் பாடமாக இடம்பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.
6. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு – I : தமிழ் இலக்கிய வரலாறு – I (8 மணிநேரம்)

முச்சங்க வரலாறு - சங்க இலக்கியத்தொகுப்பு - பாட்டும் தொகையும் - சங்கஇலக்கியச் சிறப்பியல்புகள் - சங்கம் மருவிய காலம் - பதினென்கீழ்க்கணக்கு நூல்கள் – திருக்குறள் -நாலடியார் - நான்மணிக்கடிகை - பழமொழி நானூறு – பிற்கால அறஇலக்கியங்கள் - கொன்றை வேந்தன் – நீதிநூல் - காப்பியங்கள் - தமிழில் காப்பிய இலக்கணம் - தமிழில் பெருங்காப்பியங்களும் சிறு காப்பியங்களும் - இரட்டைக்காப்பியங்களாகச் சிலம்பும் மேகலையும்.

அலகு - II: சங்க இலக்கியம்   (12 மணிநேரம்)

அ). எட்டுத்தொகை

நற்றிணை : கொண்டல் மாமழை – குறிஞ்சி – தலைவன் கூற்று - 140

குறுந்தொகை : வாரார் ஆயினும், வரினும் –முல்லை– தலைவி கூற்று - 110

ஐங்குறுநூறு : மருதம் –தோழி கூற்று-வேட்கைப்பத்து: வாழிஆதன் வாழி அவினி - 6

பதிற்றுப்பத்து : சிதைந்தது மன்ற - 27

பரிபாடல்: புறத்திரட்டு- மதுரை நகர்ச்சிறப்பு –

உலகம் ஒரு நிறையாத்தான்-7, மாயோன் கொப்பூழ்-8, செய்யாட்கு இழைத்த-9, கார்த்திகை காதில்-10, ஈவாரைக் கொண்டாடி-11.

கலித்தொகை : பாலைக்கலி- செவிலி – எறித்தரு கதிர்தாங்கி-9

அகநானூறு : அன்னை அறியினும் அறிக – தோழி - நெய்தல் - 110

புறநானூறு : யாதும் ஊரே யாவருங் கேளிர் –பொதுவியல்- 192

 ஆ). பத்துப்பாட்டு: நெடுநல்வாடை - கார்காலச் சிறப்பு : வையகம் பனிப்ப -1-70

அலகு – III : அற இலக்கியம்   (10 மணிநேரம்)

1. **திருவள்ளுவர்- திருக்குறள்**– அதிகாரம் 67 – வினைத்திட்பம், அதிகாரம் 100 - பண்புடைமை

2. **முன்றுரையரையனார் – பழமொழி நானூறு** 5 பாடல்கள் உணற்கு இனிய 5, பரந்த திறலாரை 32, நெடியது காண்கிலாய் 46, இனி யாரும் 153, உரைசான்ற 195.

3. **ஔவையார் – கொன்றை வேந்தன்** (1- 50 பாடல்கள்)
அன்னையும் பிதாவும் – புலையும் கொலையும் களவும் தவிர்

4. **வேதநாயகம்பிள்ளை - நீதிநூல்** – (அதிகாரம்-7-தாய் தந்தையரைப் போற்றுதல்- தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள்) சின்னவோர் பொருள், கடவுளை வருந்தி, எப்புவிகளும், வைத்தவர், ஈன்றவர்

5. நீதிநெறிவிளக்கம் – 1.உறுதி – உறுதிபயப்ப(254), 2.முயற்சி - முயலாது வைத்து(255), 3.உலையா முயற்சி (256), 4.காலம் – காலம் அறிந்தாங்கு (257), 5.மெய்வருத்தம் -மெய்வருத்தம் பாரார் (258)

அலகு - IV : காப்பிய இலக்கியம்   (10 மணிநேரம்)

(அ). சிலப்பதிகாரம் (5 மணிநேரம்)

மங்கல வாழ்த்துப் பாடல்: (21-29) - நாக நீள் நகரொடு-கண்ணகி என்பாண் மன்னோ. வழக்குரை காதை, (48-56) - நீர்வார் கண்ணை-புகா ரென்பதியே .

வஞ்சின மாலை: (5-34) - வன்னிமரமும் – பிறந்த பதிப் பிறந்தேன்.

நடுகற் காதை: (207-234) - அருத்திற லரசர் – மன்னவ ரேறென்

வாழ்த்துக்காதை: (9) - என்னேயிஃ தென்னே – மீவிசும்பிற் றோன்றுமால்.

(ஆ). மணிமேகலை (5 மணிநேரம்)

பசியின் கொடுமை: பாத்திரம் பெற்ற காதை:

'போதி நீழல்' - 'பெருகியதன்றோ' , 'ஆற்றுநர்க்களிப்போர்' - 'நல்லறம் கண்டனை' (73-98).

சிறைக்கோட்டம் அறக்கோட்டமாக்கிய காதை: மாவண கிள்ளிக்கு காவலன் உரைத்தவை: 'பைஞ்சேறு மெழுகாப் பசும்பொன் மண்டபத்து - அறவோர்க் காக்கின் அரசாள் வேந்தன்' (116-163).

இ). சூளாமணி - அரசியல் சருக்கம்- 1.நாவியே கமழும்(1131), 2.கண்மிசை கனிந்த (1132), 3.விரைசெல லிவுளித்(1133), 4.அரைசர்கள் வருக(1134), 5. அருளுமா றடிகள் (1135), 6.விஞ்சைய குலக (1136), 7.சொரிகதிர் (1137), 8.கரியவன் வளைந்த(1138), 9.மடித்தவா யெயிறு (1139),10. விஞ்சய ரதனைக் (1140),

துறவுச் சருக்கம் – பயாபதி மன்னனின் துறவு நெறி (1840 வது பாடல் முதல் – 1850 வது பாடல்வரை)

அலகு- V : அடிப்படை இலக்கணமும் பயன்பாட்டுத்தமிழும் - I (8 மணிநேரம்)

அ). எழுத்து, சொல், பொருள் இலக்கணங்கள் (4 மணிநேரம்)

1. முதல் மற்றும் சார்பெழுத்துகள் - பெயர், வினை, இடை, உரிச்சொல் முதலான அடிப்படை இலக்கண விளக்கப் பயிற்சிகள்
2). அகத்திணை மற்றும் புறத்திணை இலக்கணங்கள்

ஆ). கடிதப்பயிற்சி (4 மணிநேரம்)
1. வேலை வேண்டி விண்ணப்பம் எழுதுதல்
2. பல்கலைக்கழகப் பன்னாட்டுக் கருத்தரங்கச் செய்தியை நாளிதழில் வெளியிட
வேண்டி நாளிதழின் பதிப்பாசிரியருக்குக் கடிதம்
3. கருத்தரங்கப் பங்கேற்புக்கு அனுமதிக் கடிதம்
4. பல்கலைக்கழக விழாவுக்குத் தலைமையேற்க வேண்டி, மாவட்ட ஆட்சியருக்கு விண்ணப்பம்
5. கல்விகடன் வேண்டி வங்கிமேலாளருக்கு விண்ணப்பம்
6. வசிப்பிடத்திற்கு அடிப்படை வசதி வேண்டி வட்டாட்சியருக்கு விண்ணப்பம்
7. தேசியவிருது பெற்ற நண்பனுக்குப் பாராட்டுக் கடிதம்
8. புத்தகங்கள் அனுப்பி உதவவேண்டி, பதிப்பகத்தாருக்கு விண்ணப்பம்

பாட நூல்: கற்பகச்சோலை – தமிழ் ஏடு.
வெளியீடு: மொழிகள் துறை – தமிழ்ப்பிரிவு,
கற்பகம் உயர்கல்விக்கழகம்.

22ENU101   **English - I**

Semester – I
4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal: **40**   External: **60**   Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To enable the learner to communicate effectively and appropriately in real life situation
- To develop and integrate the use of the four language skills.
- To give basic knowledge on grammar.
- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.
- To identify the meaning of words using context clues.
- To Identify and employ methods used for avoiding plagiarism.

Course Outcomes (COs)
1. Retrieve fundaments of English language to construct error free sentences.
2. Develop the knowledge of interpersonal skills.
3. Establish and maintain social relationships.
4. Develop communication skills in business environment.
5. Refine communication competency through LSRW skills.
6. Improving intrapersonal skills through literary works.

Unit I
LISTENING: Listening –Types of Listening
SPEAKING: Basics of Speaking
READING: Reading – Types of Reading – Purpose of Reading
WRITING: Writing – Types of Writing – Components of Writing
LITERATURE: Poem- Ode on a Grecian Urn by John Keats
GRAMMAR: Parts of Speech

Unit II
LISTENING: Principles of Listening Skills – Tips for effective listening
SPEAKING: Telephone Skills
READING: Reading Techniques **–** Reading Newspaper, Magazine, Books and Articles
WRITING: Paragraph Writing
LITERATURE: Prose- Of Friendship by Francis Bacon
GRAMMAR: Articles

Unit III
LISTENING: Barriers of Listening – Problems of Listening
SPEAKING: Role Play (formal Context)
READING: Developing Analytical Skills, Skimming and Scanning
WRITING: Precise Writing
LITERATURE: Short Story: The Umbrella man by Roald Dahl
GRAMMAR: Tense

Unit IV
LISTENING: Note Taking
SPEAKING: Group Discussion
READING: Reading Comprehension
WRITING: Report Writing
LITERATURE: Poem: Tyger by Wiiliam Blake
GRAMMAR: Subject and Predicate – Question Tags

Unit V
LISTENING: Academic Listening – Listening to Radio and Television
SPEAKING: Interview Skills
READING: Tips for MOC- Anchoring
WRITING: Writing a Book Review
LITERATURE: Short story: Rapunzel by the Brothers Grimm
GRAMMAR: Framing Questions

Suggested Readings
1. Wren & Martin*, High School English Grammar & Composition*, S.Chand & Company Ltd, 2008Board of Editors, *Vibrant* English for Enhancement, Emerald Publishers, 2012
2. Krashen, Stephen D (1982) Principles and practice in second language acquisition. New York: Pergamon Press.

Semester – I

22ITU101   **Problem Solving Techniques**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)

- To develop a basic understanding of many areas of information technology and how they are used
- To understand the basic structure of a program including sequence, decisions and looping
- To understand how to design a program to solve a simple program
- To introduce the basics of several programming language and understand the commonality and differences in languages
- To lay a basic foundation involving hardware, software, navigation, the Internet for future development
- To understand what a database is and how to design a working model

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Demonstrate knowledge of high-level structured programming logic and algorithm development.
2. Demonstrate knowledge of structured program design and modularity.
3. Demonstrate knowledge of file-based input/output operations, file manipulation and maintenance, extract reporting, and report writing.
4. Demonstrate knowledge of records, data types and structures, storage classes, addressable memory locations.
5. Demonstrate knowledge of table utilization, arrays and subscripts.
6. Demonstrate knowledge of arithmetic expressions, control structures, iteration techniques.

Unit – I
Language Evolution Machine Language, Assembly Language, High Level Language. Translators: compiler, Interpreter and Assembler. The Compilation Process, Linker, Loader, Study of HLL, Characteristics of Good Language, Generation of Languages, Study of Programming Languages (Function Oriented, Object Oriented, Event-Based). Problem Solving and Algorithmic Thinking Overview – problem definition, logical reasoning;

Unit II
Programming Construction Tools Problem Analysis, Process Analysis, Conceptual Development of Solution. Development Tools: Algorithm – definition, practical examples, properties, representation, algorithms vs programs. Algorithm: Types of Algorithms, Algorithm of Analysis, Advantage and Disadvantage of Algorithm, Complexity of Algorithm, Big-O Notation.

Unit III

Flowcharts: Types of Flowcharts, Advantage and Disadvantage of Flowchart. Pseudocode: Definition and Its Characteristics Control Statements Basics of C Programming Language: Usage of Character Set, Meaning of Keywords and Identifiers, Role of Data Types, Constants and Variables.

Unit – IV
Importance of Casting, Different Types of Operators and their Precedence, Expressions, Conditional Statements (One-Way, Two-Way and Multi-Way Conditional), Looping Statements (For, While, do-while), Usage of Exit, continue, Break and Goto Statement.

Unit – V
Arrays: Arrays, One dimensional array, Various operation on Array (Inserting of Elements, Deleting of Element, Rotating List, Sorting, Searching, Merging etc) and Two dimensional arrays (Matrix Addition, Transpose of Matrix, Matrix Multiplication), Modular programming and its features.

.
Suggested Readings:

1. Ferragina P, Luccio,(2018) Computational Thinking: First Algorithms, Then Code. Springer.
2. Beecher (2017), Computational Thinking: A beginner's guide to Problem-solving and Programming, BCS Learning & Development Limited.
3. Curzon P, McOwan (2017), The Power of Computational Thinking: Games, Magic and Puzzles to help you become a computational thinker. World Scientific Publishing Company.
4. Anil V.Chouduri.(2016), The Art of Programming through Flowchart and Algorithms. Laxmi Publication.
5. Riley DD, Hunt KA(2014). Computational Thinking for the Modern Problem Solver. CRC press.
6. Maureen Sprankle (2009). Problem Solving Programming Concepts (7th ed.). Pearson Education.

Websites
1. http://www.cs.cf.ac.uk/Dave/C/CE.html
2. http://www2.its.strath.ac.uk/courses/c/
3. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html

Semester – I

22ITU102   Object Oriented Programming Using C++   4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal: **40**   External: **60**   Total: **100**
End Semester Exam: 3 Hours

Course Objectives (CO)
- The objective of this course is to provide the student with the fundamental knowledge and skills to become a proficient C++ programmer.
- The student will learn to transpose the physical problem domain into a hierarchy of objects.
- Industry standard software engineering techniques will be presented and used to architect the system design.
- Objects, their behaviors, and their relationships, will be modeled and these models will be programmed into a functional application that the student will compile, modify, enhance and run.
- The student will program in a structured style whereby reinforcing the concepts of software quality, reliability and maintainability.
- To learn file handling in C++.

Course Outcomes (COs)
Upon completion of this course the students will be able to:
1. Understand the difference between top-down and bottom-up approach.
2. Apply the concepts of object-oriented programming in constructor and destructor.
3. Understand how to apply the major object-oriented concepts to implement inheritance and polymorphism.
4. Apply pointer concepts in C++
5. Understand how to manage console I/O operations.
6. Use the concepts of preprocessor directives and macros.

Unit I
Introduction: Principles of object-oriented programming: Basic concepts of object-oriented programming – Benefits of OOP – Applications of OOPs – Structure of C++ Program C++ Tokens – Control Statement – Decision Making Statements- Loop Statements - Inline Functions – Function Overloading.

Unit II
Control Structure, Functions and Constructors: Classes and Objects: Specifying a class – Creating Objects – Accessing Class Members – Defining Member Functions – Static Data Members – Static Member Functions - Array of Objects – Friend Functions. Constructors and Destructors: - Constructors – Parameterized Constructors - Multiple Constructors in a Class – Constructors with Default Arguments - Copy Constructor - Dynamic Constructor – Destructors.

Unit III
Operator Overloading and Inheritance: Operator overloading: Defining operator overloading – overloading unary operators – overloading binary operators – overloading binary operators using

friends – type conversions. Inheritance: - Inheritance – defining derived classes – single, multilevel, multiple, hierarchical inheritance- hybrid inheritance – virtual base classes – abstract classes.

Unit IV

Pointers and I/O Operations: Pointers: Pointers to objects – this pointer – pointers to derived classes – virtual functions- Pure Virtual Functions. Managing console I/O operations :- C++ streams – C++ stream classes – unformatted I/O operations – formatted console I/O operations – Managing output with manipulators.

Unit V

File Management: Files: Classes for file stream operations – Opening and Closing a file – sequential input and output operations – updating a file random access – Command Line Arguments. Templates and Exceptions:- Templates – class templates – function templates – member function templates – exception handling.

Suggested Readings

1. Antonio Mallia, Francesco Zoffoli,(2019), C++ Fundamentals, Packt Publishing, Ltd.
2. Joel Murach, Mary Delamater,(2018), C++ Programming ,Mike Murach & Associates Inc.
3. Stefan Bjornander, (2016), C++ Windows Programming, Published byPackt Publishing Ltd.
4. Richard L. Stegman, (2016), Focus on Object-oriented Programming with C++, 6th Edition, CreateSpace Independent Publishing Platform.
5. Harry, H. Chaudhary, (2014), Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.
6. Debasish Jana, (2014), C++ And Object-Oriented Programming Paradigm,Published by PHI Learning Pvt. Ltd
7. Bjarne Stroustroup, (2014), Programming - Principles and Practice using C++, 2nd Edition, Addison-Wesley.
8. K.R.Venugopal and Rajkumar Buyya, (2013), Mastering C++ 2nd Edition, Tata Mc Graw Hill Education, New Delhi.

Websites

1. www.programmingsimplified.com
2. www.programiz.com / cpp-programming
3. www.cplusplus.com
4. www.learncpp.com
5. www.udemy.com
6. https://nptel.ac.in/courses/106101208/

LMS

http://172.16.13.33/course/view.php?id=599

22ITU103   **Numerical Methods**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal: **40**   External: **60**   Total: **100**
                                                                      End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the basic concepts of numerical methods
- To develop the mathematical skills in the areas of numerical methods.
- To understand numerical techniques as powerful tool in scientific computing.
- To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
- To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.

Course Outcomes (COs)
On completion of the course students will be able to
1. Apply Numerical analysis which has enormous application in the field of Science
2. Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
3. Familiar with calculation and interpretation of errors in numerical method.
4. Develop and apply the appropriate numerical techniques for the problem, interpret the results, and assess accuracy.
5. Understand the basics of Numerical Differentiation & Integration and numerical solutions of ordinary differential equations.
6. Understand the concepts of difference operators and the use of Interpolation.

UNIT I
The Solutions of Numerical Algebraic and Transcendental equations: Bisection method - iteration method- False Position method - Newton's method .

UNIT II
Solution of Simultaneous Linear algebraic Equation – Gauss elimination method- Gauss Jordon method- Gauss Jacobi method- Gauss Seidel methods.

UNIT III
Interpolation :Gregory-Newton forward and backward interpolation Formula– equidistant terms with one or more missing values - Lagrange and Inverse Lagrange Interpolation formula.

UNIT IV

Numerical Differentiations : Newton's forward Difference and Newton's Backward Difference formula. Numerical Integration: Trapezoidal Rule & Simpson's Rule.

UNIT V

Numerical Solution of Ordinary Differential Equations:Taylor's series - Euler's method – Modified Euler's method - Runge-Kutta methods (fourth order Runge Kutta method only) .

Suggested Readings

1. P. Kandasamy, Dr. K. Thilagavathy, Dr. K. Gunavathi (2013), Numerical Methods, Published By S.Chand & Company Pvt. Ltd., New Delhi.
2. M.K. Jain, S.R.K. Iyengar and Jain R.K (2012), Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi.
3. T. Veerarajan and T. Ramachandran (2008), Numerical Methods with Programs in C, Tata McGraw-Hill Publishing company limited, New Delhi.
4. B. Bradie (2007), A Friendly Introduction to Numerical Analysis, Pearson Education, India.

Websites

1. https://youtu.be/tcqsLqlyjmk
2. https://youtu.be/0XcOwBY_Ryw

<table>
<tr><td>22ITU111</td><td>Office Automation-Practical</td><td>Semester – I
3H – 2C</td></tr>
</table>

Instruction Hours / week: L: 0 T: 0 P: 3   **Marks:** Internal : **40**   External : **60** Total: **100**
                                                                      End Semester Exam : 3 Hours

Course Objectives (CO)

- To create a document in Microsoft Word with formatting options, edit, save, and print documents to include documents with lists and tables, Format text and to use styles, add a header and footer to a document, add a graphic to a document.
- To write functions in Microsoft Excel to perform basic calculations and to convert number to text and text to number.
- To indicate the names and functions of the Excel interface components.
- To enter and edit data, Format data and cells.
- Construct formulas, including the use of built-in functions, and relative and absolute references, modify charts.
- To improve creative thinking in presentation software.

Course Outcomes (COs)
After completion of this course, the students will be able to
1. Remember the concept of word processing.
2. Understanding the tools in Microsoft word.
3. Understand and Apply Excel Features.
4. Evaluate the EXCEL functions.
5. Analyze the different designs of MS Presentations.
6. Apply the different animation and designs in the presentation slides

List of Programs

MS-WORD
1. Text Manipulation: Write a paragraph about your institution and Change the font size and type, Spell check, Aligning and justification of Text.

2. Bio data: Prepare a Bio-data.

3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace - Use Numbering Bullets, Footer and Headers.

4. Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows). Create a mark sheet.

5. Mail Merge: Prepare an invitation to invite your friends to your birthday party. Prepare at least five letters.

MS-EXCEL
1. Data sorting-Ascending and Descending (both numbers and alphabets).

2. Mark list preparation for a student.

3. Individual Pay Bill preparation.

4. Invoice Report preparation.

5. Drawing Graphs. Take your own table.

MS-POWERPOINT
1. Create a slide show presentation for a seminar.

2. Preparation of Organization Charts.

3. Create a slide show presentation to display percentage of marks in each semester for all

   students

   i.   Use bar chart (X-axis: Semester, Y-axis: % marks).

   ii.   Use different presentation template different transition effect for each slide.

Suggested Readings

1. Sanjay Saxena,(2019) A First Course in Computers (Based on Windows 8 And MS Office 2013) Vikas Publishing.
2. R. Gabriel Gurley ,(2018),A Conceptual Guide to OpenOffice.org 3- CreateSpace Independent Publishing Platform.
3. Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole (2018) Introduction to Information Technology - Imprints Pvt. Ltd.
4. P. K. Sinha ,(2017),Computer Fundamentals - Publisher: BPB Publications.
5. R. Gabriel Gurley,(2017) A Conceptual Guide to OpenOffice.Org 2 for Windows and Linux .
6. John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki ,(2017),Microsoft Office 2007 Bible -Wiley India pvt.ltd .

Websites
1. https://www.tutorialspoint.com/word/word_tutorial.pdf
2. https://it.fit.edu
3. https://www.tutorialspoint.com/excel/excel_pdf_version.htm
4. https://web.itu.edu.tr/~tasking/Gulsen_Taskins_homepage/bil101e_files/powerpoint_how_to .pdf
5. https://www.srsd.net/tech/docs/powerpointbeginnerstutorial.pdf

Semester – I

22ITU112   Object Oriented Programming Using C++ - Practical   4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4   Marks: Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To understand how C++ improves C with object-oriented feature.
- To learn the syntax and semantics of classes in C++ programming language.
- To learn how to perform operator overloading and inheritance.
- To learn how to design C++ using pointers.
- To learn file handling in C++.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

Course Outcomes (COs)

Upon completion of this course the students will be able to :

1. Understand the difference between top-down and bottom-up approach.
2. Apply the concepts of object-oriented programming in constructor and destructor.
3. Understand how to apply the major object-oriented concepts to implement inheritance and polymorphism.
4. Apply pointer concepts in C++
5. Use the concepts of preprocessor directives and macros.
6. Understand about the code reusability with the help of user defined functions.

List of Programs

1. Write a C++ program to print sum of digits.
2. Write a C++ program to check palindrome number.
3. Write a program to swap numbers using friend function.
4. Write a program to perform multiplication of two matrices using operator overloading.
5. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers.

6. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

7. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

8. Write a C++ Program to store GPA of n number of students and display it where n is the number of students entered by user (Memory Management).

9. Write a program to demonstrate the try, catch block in C++

10. Write a C++ program that uses a single file for both reading and writing the data.

Suggested Readings

1. Antonio Mallia, Francesco Zoffoli,(2019), C++ Fundamentals, Packt Publishing, Ltd.
2. Joel Murach, Mary Delamater,(2018), C++ Programming ,Mike Murach & Associates Inc.
3. Stefan Bjornander, (2016), C++ Windows Programming, Published byPackt Publishing Ltd.
4. Richard L. Stegman, (2016), Focus on Object-oriented Programming with C++, 6th Edition, CreateSpace Independent Publishing Platform.
5. Harry, H. Chaudhary, (2014), Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.
6. Debasish Jana, (2014), C++ And Object-Oriented Programming Paradigm,Published by PHI Learning Pvt. Ltd
7. Bjarne Stroustroup, (2014), Programming - Principles and Practice using C++, 2nd Edition, Addison-Wesley.
8. K.R.Venugopal and Rajkumar Buyya, (2013), Mastering C++ 2nd Edition, Tata Mc Graw Hill Education, New Delhi.

Websites

1. www.programmingsimplified.com
2. www.programiz.com / cpp-programming
3. www.cplusplus.com
4. www.learncpp.com
5. www.udemy.com

Semester – I

22ITU113	**Numerical Methods-Practical**	**3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3   **Marks:** Internal : **40**   External : **60** Total: **100**

                                                            End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the basic concepts of numerical methods
- To develop the mathematical skills in the areas of numerical methods.
- To understand numerical techniques as powerful tool in scientific computing.
- To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
- To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations.

Course Outcomes (COs)
On completion of the course students will be able to
1. Apply Numerical analysis which has enormous application in the field of Science
2. Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.
3. Familiar with calculation and interpretation of errors in numerical method.
4. Develop and apply the appropriate numerical techniques for the problem, interpret the results, and assess accuracy.
5. Understand the basics of Numerical Differentiation & Integration and numerical solutions of ordinary differential equations.
6. Understand the concepts of difference operators and the use of Interpolation.

List of Practical (Using any software)
(Any 10 Programs)
1. Solution of simultaneous linear algebraic equations- Gauss Elimination Method
2. Solution of simultaneous linear algebraic equations- Gauss Jordan Method
3. Solution of simultaneous linear algebraic equations- Gauss Jacobi Method
4. Solution of simultaneous linear algebraic equations- Gauss Seidal Method
5. Computing Lagrange's interpolating polynomial
6. Computing Newton's interpolating polynomial
7. Numerical Integration – Simpson's one third rule
8. Numerical Integration – Simpson's three eight rule
9. Numerical Integration – Trapezoidal rule
10. Solution for ordinary differential equation-Euler method.
11. Solution for ordinary differential equation- Runge Kutta Second order.

Suggested Readings

1. P. Kandasamy, Dr. K. Thilagavathy, Dr. K. Gunavathi (2013), Numerical Methods, Published By S.Chand & Company Pvt. Ltd., New Delhi.
2. M.K. Jain, S.R.K. Iyengar and Jain R.K (2012), Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi.
3. T. Veerarajan and T. Ramachandran (2008), Numerical Methods with Programs in C, Tata McGraw-Hill Publishing company limited, New Delhi.
4. B. Bradie (2007), A Friendly Introduction to Numerical Analysis, Pearson Education, India.

22LSU201   **Language - II**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal : **40**   External : **60** Total: **100**
End Semester Exam: 3 Hours

பாடத்திட்டப் பொதுநோக்கம்
- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும்
- ஆய்வுநோக்கையும் மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல்.
- அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன் விளைவு
1. இந்தியகுடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்தமுழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத்தேடலுக்குரிய ஆய்வுமனப்பான்மையுடன், இலக்கியங்களைஅணுகுதல்.
3. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்';' இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன்மேம்பாட்டுடன், படைப்பாக்கத் திறன்மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாயமற்றும்வாழ்வியல்மதிப்புகளைப்பேணுவதற்குக்கருவியா கஇலக்கியங்களைநாடுகின்றமனப்பான்மைவளர்ச்சி.
6. மொழிபெயப்புத்துறை சார்ந்த வேலைவாய்புத் திறன் பெற்றிருத்தல்

அலகு - I : தமிழ் இலக்கிய வரலாறு- II   (5 மணிநேரம்)
தமிழ் இலக்கிய வரிசையில் திருமுறைகளும் நாலாயிரத் திவ்யப்பிரபந்தமும் - பன்னிரு திருமுறைகள் அறிமுகம் - திருமுறை ஆசிரியர்களின் இலக்கியப் பங்களிப்பு -திருமுறைகளில் பக்திநெறியும் சமுதாய நோக்கும் - சமயக்குரவரின் அருள்நெறி - பன்னிரு ஆழ்வார்கள் வரலாறு - ஆழ்வார்களின் இலக்கியப் பங்களிப்பு - திவ்யப் பிரபந்தத்தில்

பக்திநெறியும் இலக்கிய நயமும் - தமிழில் சிற்றிலக்கியக் காலமும் கருத்தும் - தொண்ணூற்றாறு வகைச் சிற்றிலக்கிய வரிசை - தமிழ் மொழியின் நாவல், சிறுகதை -கட்டுரை – கவிதை - திறனாய்வு நூல்களின் தோற்றம் - வளர்ச்சி - உத்திகள் - நாட்டுப்புற இலக்கியங்கள் - கொங்குநாட்டார் வாய்மொழி வழக்காறுகள்.

அலகு – II : பக்தி இலக்கியமும் சிற்றிலக்கியமும்:

பக்தி இலக்கியம்   **(12 மணிநேரம்)**

சைவ, வைணவ இலக்கியங்கள் - தோற்றம் , வளர்ச்சி, வரலாறு.

சைவம் - (19 பாடல்கள்) பெரியபுராணம் – இளையான்குடி மாறநாயனார் புராணம் .

வைணவம் - ஆண்டாள் நாச்சியார் திருப்பாவை : (11 பாடல்கள்): மார்கழித்திங்கள், வையத்து வாழ்வீர்காள், ஓங்கி உலகளந்த, ஆழி மழைக்கண்ணா, மாயனை மன்னுவட மதுரை, சிற்றம் சிறுகாலே, ஒருத்தி மகனாய், மாலே மணிவண்ணா, கூடாரை வெல்லும், கறவைகள் பின்சென்று, வங்கக்கடல் கடைந்த.

சிற்றிலக்கியம்

1. முக்கூடற் பள்ளு- 2 பாடல்கள் - சித்திரக் காலிவாலான்

(நெல்வகைகள்) குற்றாலத் திரிகூட மால்வரை (மீன் வகைகள்)

2.நந்தி கலம்பகம்- 5 பாடல்கள் - என்னையே புகழ்ந்தேன், பதிதொறு புயல்பொழி, இந்தப்புவியில், அடிவிளக்கும் துகில், வானுறுமதியை

3. மதுரைச் சொக்கநாதர் தமிழ்விடு தூது - தமிழின் சிறப்பு பாடியருள பத்துப்பாட்டும் - விளம்பக்கேள்.

4. **தமிழலங்காரம்** – வண்ணச்சரபம் தண்டபாணி சுவாமிகள் - 10 பாடல்கள்

1. கடல் நீரில் கல் மிதக்கும், 2. வண்டமிழ் ஆற்றுதி, 3. கோளத்தை முட்டி

4. எக்காலம் என்று, 5. கடவூர் மயானத்தொர், 6. தேவாதி தேவன், 7. விண்மாரி,

8. தேவர் முனிவர், 9. அழுதேங்கி நஞ்சிட்ட, 10. அத்தனை பொத்து.

5. அருள்தரும் பூங்கோதையன்னை பிள்ளைத்தமிழ் - 1.காப்புப்பருவம் - கோத்தமிழ் குமரகுரு,

2.சப்பாணிப்பருவம் – பட்டிமுனி கோழுனி, 3.ஊசல்பருவம் - நாவரசர் நற்றமிழால் (முதுமுனைவர் ந.இரா.செந்நியப்பனார்)

அலகு – III: கவிதையும், சிறுகதையும்

அ). கவிதை இலக்கியம்

1. மகாகவி பாரதியார்   -   கண்ணன் என் சீடன்
2. புரட்சிக்கவிஞன் பாரதிதாசன் - இளையார்ஆத்திச்சூடி-

அழுபவன்கோழை

3. கவிமணி தேசிக விநாயகம் பிள்ளை -   கோவில் வழிபாடு.
4. கவிக்கோ. அப்துல்ரகுமான்   - பாருக்குள்ளே நல்ல நாடு.
5. சிற்பி பாலசுப்பிரமணியன்   -   மலையாளக்காற்று
6. கவிஞர் தாமரை   -   தொலைந்து
போனேன்.
7. கவிஞர் கரிகாலன்   -   விடுதலை
8. கவிஞர் அறிவுமதி   -   நட்புக்காலம்
9. கவிஞர் சுகந்தி சுப்பிரமணியம்   - புதையுண்ட வாழ்க்கை

ஆ). சிறுகதை இலக்கியம்

1. சாபவிமோசனம்   - புதுமைப்பித்தன்
2. நகரம்   -   சுஜாதா
3. அந்நியர்கள்   -   ஆர். சூடாமணி
4. இந்நாட்டு மன்னர்   -   நாஞ்சில் நாடன்
5. வல்லூறுகள்   -   அம்பை

அலகு - IV : உரைநடை இலக்கியம்

1. ஆளுமைத்திறன் அறிவோம் -தன்னம்பிக்கை மாத இதழ்
2.   திருக்குறளும் சமுதாயவியலும் -முனைவர் புரிசை நடராசன்
3. உயர்தனிச் செம்மாழி - முனைவர் இரா. குணசீலன்
4. நொய்யல் - முனைவர் ப.தமிழரசி

அலகு- V : அடிப்படை இலக்கணமும் பயன்பாட்டுத் தமிழும் - II (7மணிநேரம்)

இலக்கணப் பயிற்சி : அணி இலக்கணம்

உவமையணி - பிறிது மொழிதல் அணி - சிலேடை அணி - தீவக அணி - ஏகதேச உருவக அணி - வேற்றுமையணி - பின்வருநிலையணி விளக்கங்கள்.

துறை சார் கலைச்சொல் பயன்பாட்டாக்கம்

படைப்பிலக்கியப் பயிற்சிகள்

மரபுக்கவிதை, புதுக்கவிதை, சிறுகதை, கட்டுரை படைப்பாக்க உத்திகள் - பயிற்சிகள் - நேர்காணல் வினா நிரல் தயாரித்தல் நுட்பங்கள்

மொழிபெயர்ப்புப் பயிற்சிகள்

தமிழ்   - ஆங்கில மொழிபெயர்ப்புப் பயிற்சிகள் - 2.
ஆங்கிலம் - தமிழ் மொழிபெயர்ப்புப் பயிற்சிகள் - 2.

பாடநூல்:கற்பகச்சோலை – தமிழ்ஏடு.
கற்பகம் உயர்கல்வி கலைக்கழகத்தமிழ்த்துறை வெளியீடு.

Semester – II

22ENU201   **ENGLISH - II**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal : **40**   External : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To refresh the grammar knowledge of the students to improvise their language.
- To make the students to speak and write error free English.
- To make the students understand different kinds of communication.
- To develop knowledge on the business environment communication.
- To help the students develop their listening, speaking, reading and writing skills.
- Introducing literary works to the students to enhance their analytical and aesthetic skills.

Course Outcomes (COs)
1. Strengthen the foundation of the language to elevate the command of standard grammar.
2. Inculcate the proper communication strategy.
3. Formulate and communicate persuasive arguments for specific business outcome.
4. Apply fundamentals of language for reading, writing and effective communication.
5. Standardize and demonstrate understanding of LSRW skills.
6. Introduce literature to enhance the moral and aesthetic values.

Unit-I
Listening	**:** Goals of listening
Speaking	**:** Developing speaking skills
Reading	**:** Reading strategies
Writing	**:** Importance of professional writing-Developing a story with pictures
Grammar	**:** Voice
Literature	**:** Refuge Mother and Child by Chinua Achebe

Unit- II
Listening	**:** Dictation
Speaking	**:** Public speaking and secrets of good delivery
Reading	**:** Reading Passages-Reading Comprehension-Vocabulary skills
Writing	: Essay writing
Grammar	**:** Subject, verb, agreement
Literature	**:** Prose: Diamond of Creativity by A.P.J. Abdul Kalam

Unit-III
Listening	**:** Electronic recordings and listening
Speaking	**:** Oral presentation
Reading	: Note Making- Fluency in reading
Writing	**:** Layout of Business Letters-Letter writing
Grammar	**:** Degrees of comparison
Literature	**:** River by A.K. Ramanujan

Unit- IV
Listening	**:** Listening to instructions and announcements

Speaking : Video conferencing
Reading : Silent reading and methods of reading
Writing : Basic content writing
Grammar : Phrases and clauses
Literature : Two Gentlemen of Verona by A.J. Cronin

Unit-V

Listening ; Testing listening
Speaking : Dialogues
Reading : Developing reading activities
Writing : Writing agendas, memos and minutes
Grammar : Direct and indirect speech
Literature : Banquet Speech by Nadine Gordimer (Noble Prize Acceptance Speech)

Suggested Readings

1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 CU Press
   Sound Business, Julian Treasure 2012OUP
2. Hornby, A,S.(1975) The Guide to patterns and usage in English: oxford university Press.
3. Ellis, R.(1990) Instructed second language acquisition. Oxford: oxford university Press.

22ITU201   **Programming in Java**   Semester – II
                                                                         6H – 6C

Instruction Hours / week: L: 6 T: 0 P: 0   Marks: Internal : **40**   External : **60** Total: **100**
                                               End Semester Exam : 3 Hours

Course Objectives (CO)
- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)
Upon completion of this course the student will be able to:
1. Obtain knowledge of the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Use the certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

Unit I - Introduction to Java

History of JAVA, The Java Buzzwords, Evolution of JAVA, An Overview of Java, Compiling and Executing a Java Program, Variables, Constants, Keywords Data Types, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing Basic Program Output, Decision Making Constructs (conditional statements and loops) and Nesting.

Unit II - Arrays, Strings and I/O

Object-Oriented Programming Overview Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access to Class Members, Class Constructors, Method Overloading, Class Variables & Methods, Objects as parameters, final classes, Object class, Garbage Collection-Creating & Using Arrays (One Dimension and Multi-dimensional),

Referencing Arrays Dynamically, Java Strings: The Java String class, Creating & Using String Objects, Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods, String Buffer Classes. Simple I/O using System.out and the Scanner class, Byte and Character streams, Reading/Writing from console and files.

Unit III - Inheritance

Inheritance: (Single Level and Multilevel, Method Overriding, Dynamic Method Dispatch, Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package and Class Visibility, Using Standard Java Packages (util, lang, io, net), Wrapper Classes.

Unit IV - Exception Handling and Database Connectivity

Exception types, uncaught exceptions, throw, built-in exceptions, creating your own exceptions; Multi-threading: The Thread class and Runnable interface, creating single and multiple threads, Thread prioritization, synchronization and communication, suspending/resuming threads. Accessing and manipulating databases using JDBC.

Unit V – Java GUI Programming using Swing

Working with Graphics, Incorporating Images & Sounds. Event Handling Mechanisms, Listener Interfaces, Adapter and Inner Classes. The design and Implementation of GUIs using Swing components of Java Foundation Classes such as labels, buttons, text fields, layout managers, menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals, using different fonts.

Suggested Readings

1. Cay S. Horstmann, Gary Cornell,(2019) ,Core Java 2 Volume 2 - Advanced Features, 9th Edition, Pearson.

2. E. Balaguruswamy, (2019), Programming with Java, 6th Edition, McGraw Hill.

3. Ben Evans and David Flanagan, (2019), Java in a Nutshell, Seventh Edition. O'Reilly Media, Inc.

4. Cay S. Horstmann, Gary Cornell, (2018), Core Java 2 Volume 1 ,11th Edition, Prentice Hall.

5. Paul Deitel, Harvey Deitel, (2018), Java: How to Program (Early Objects), 11th Edition, Prentice Hall.

6. Herbert Schildt,(2017), Java the Complete Reference, 8th Edition, Mc Graw Hill , ORACLE PRESS.

7. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley,(2015), The Java

Language Specification, Java SE 8th Edition (Java Series), Published by Addison Wesley.

8. David J. Eck,(2015), Introduction to Programming Using Java 8th Edition, Published by CreateSpace Independent Publishing Platform.

Websites

1. https://docs.oracle.com/java
2. https://www.tutorialspoint.com/java/index.htm
3. https://www.w3schools.com/java/
4. https://www.javatpoint.com/java-tutorial
5. https://www.geeksforgeeks.org/java-tutorials/
6. https://nptel.ac.in/courses/106105191

Semester-II

22ITU202   **Discrete Structures**   **5H – 5C**

Instruction Hours / week: L: 5 T: 0 P: 0   **Marks:** Internal : **40**   External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)
- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)
On successful completion of the course, students will be able to
1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

Unit I

Prepositional Logic: Prepositions - Truth tables - Logical Connectives - Well formed Formulas -Demorgan's Law - Tautologies and Contradictions - PDNF and PCNF – Equivalences - Inference Theory - Rules of universal specification and generalization.

Unit II

Sets: Introduction - Finite and infinite sets - Uncountably infinite sets - Relations and its types - Properties of Binary Relations – Closure - Partial Ordering Relations - Definition of Functions and its classification – Types of functions - Composition of functions.

Unit III

Combinatorics: Pigeonhole principle - Permutation and Combination - Mathematical Induction - Principle of Inclusion and Exclusion.

Unit IV

Recurrences: Recurrence Relations - Generating Functions - Linear Recurrence Relations with Constant Coefficients and their Solution.

Unit V

Graph Theory: Introduction - Basic Terminology - Graph Representation - Types of graphs - Multigraphs and Weighted Graphs - Graph Isomorphism – Connectivity - Euler and Hamiltonian Paths and Circuits -Trees - Basic Terminology and Properties of Trees.

Suggested Readings

1. Kenneth Rosen., (2019). Discrete Mathematics and Its Applications (8th ed.), McGraw Hill Company, New Delhi.
2. Dr. Singaravelu A., and Dr. Jeyaraman M.P., (2019). Discrete Mathematics, Meenakshi Agency Chennai.
3. Hunter, D.J. (2016). Essentials of Discrete Mathematics (3rd ed.). Jones and Bartlett Publishers, New Delhi.
4. Sharma J. K., (2011). Discrete Mathematics (Third Edition),Rajiv Beri for Macmillan Publishers India Ltd. New Delhi.
5. Hein, J.L., (2010). Discrete Structures, Logic, and Computability (3rd ed.), Jones and Bartlett Publishers, New Delhi.
6. Tremblay, J. P., and Manohar R., (2008). Discrete Mathematical Structures with Applications to Computer Science (1st ed.), McGraw-Hill Book Company, New Delhi.

Websites

1. https://youtu.be/u4IQh46VoU4
2. https://youtu.be/fZqfkJ-cb28
3. https://www.youtube.com/watch?v=6WGWFwgXhd4
4. https://www.youtube.com/watch?v=HmQR8Xy9DeM
5. https://www.youtube.com/watch?v=_-QZQNSmIpw

22ITU211   **Programming in Java-Practical**

Semester – II
4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4   Marks: Internal : **40**   External : **60** Total: **100**
                                                              End Semester Exam : 3 Hours

Course Objectives (CO)
- To understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To use the Java SDK environment to create, debug and run simple Java programs.
- To use Java in various technologies in different platforms.
- To understand the fundamental of Packages and access modifiers and interface in java.
- To understand the fundamental of Exception Handling and AWT component and AWT classes.

Course Outcomes (COs)
1. Student will obtain knowledge of the structure and model of the Java programming language.
2. How to use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Programs

1. Write a program to find the sum of series $1+x+x^2+x^3+$……..
2. To find the sum of any number of integers entered as command line arguments
3. Write a program to find maximum and sum of an array
4. Write a Program to generate Fibonacci Series and Factorial for a number
5. Write a program to perform string operations
6. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
7. Write a program to an exception out of bounds, if mark is greater than 100 throw an exception
8. Write a program ―DivideByZero‖ that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
9. Write a program to generate multiplication table by multithreading
10. Write a program to demonstrate priorities among multiple threads

Suggested Readings

1. Cay S. Horstmann, Gary Cornell,(2019) ,Core Java 2 Volume 2 - Advanced Features, 9th Edition, Pearson.

2. E. Balaguruswamy, (2019), Programming with Java, 6th Edition, McGraw Hill.

3. Ben Evans and David Flanagan, (2019), Java in a Nutshell, Seventh Edition. O'Reilly Media, Inc.

4. Cay S. Horstmann, Gary Cornell, (2018), Core Java 2 Volume 1 ,11th Edition, Prentice Hall.

5. Paul Deitel, Harvey Deitel, (2018), Java: How to Program (Early Objects), 11th Edition, Prentice Hall.

6. Herbert Schildt,(2017), Java the Complete Reference, 8th Edition, Mc Graw Hill , ORACLE PRESS.

7. James Gosling, Bill Joy, Guy L Steele Jr, Gilad Bracha, Alex Buckley,(2015), The Java

Language Specification, Java SE 8th Edition (Java Series), Published by Addison Wesley.

8. David J. Eck,(2015), Introduction to Programming Using Java 8th Edition, Published by CreateSpace Independent Publishing Platform.

Websites

1. https://docs.oracle.com/java
2. https://www.tutorialspoint.com/java/index.htm
3. https://www.w3schools.com/java/
4. https://www.javatpoint.com/java-tutorial
5. https://www.geeksforgeeks.org/java-tutorials/

22ITU212   **Discrete Structures - Practical**   Semester – II
                                                                  4H – 2C

Instruction Hours / week: L: 0 T: 0 P: 4   Marks: Internal : **40**   External : **60** Total: **100**
                                                          End Semester Exam : 3 Hours

Course Objectives (CO)
- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation
- To solve problems with the help of tools of mathematical analysis.

Course Outcomes (COs)
On successful completion of the course, students will be able to
1. Familiar with elementary algebraic set theory.
2. Acquire a fundamental understanding of the core concepts in growth of functions.
3. Describe the method of recurrence relations.
4. Get wide knowledge about graphs and trees
5. Initiate to knowledge from inference theory
6. Solve problems with the help of tools of mathematical analysis

List of Programs

1. Write a C Program to find the number of subsets of a set contains n elements.

2. Write a C Program to find transitive closure of a relation.

3. Write a C Program to prove

    $1/ (1*2) + 1/(2*3) \ldots\ldots+1/(n(n+1)) = n/(n+1)$

4. Write a C Program to to perform the sum $= 1+ (1+2) + (1+2+3) + \ldots + (1+2\ldots+n)$

5. Write a C program to print Fibonacci series till Nth term using recursion

6. Write a Cprogram in c to calculate factorial of a number using recursion

7. Write a C Program to find a minimum spanning tree using Prim's algorithm

8. Write a C program to find the shortest path with the lower cost in a graph using Dijkstra's

    Algorithm

9. Write a C Program to construct the truth table for the following formula.

    (i) $P \wedge Q \wedge \rceil R$ (ii) $P \wedge \rceil Q \wedge R$ (iii) $P \wedge Q \wedge \rceil R$

10. Write a C Program to prove De – Morgan's law.

Suggested Readings

1. Kenneth Rosen., (2019). Discrete Mathematics and Its Applications (8thed.), McGraw Hill Company, New Delhi.

2. Dr. Singaravelu A., and Dr. Jeyaraman M.P., (2019). Discrete Mathematics, Meenakshi Agency Chennai.

3. Hunter, D.J. (2016). Essentials of Discrete Mathematics (3rd ed.). Jones and Bartlett Publishers, New Delhi.

4. Sharma J. K., (2011). Discrete Mathematics (Third Edition),Rajiv Beri for Macmillan Publishers India Ltd. New Delhi.

5. Hein, J.L., (2010). Discrete Structures, Logic, and Computability (3rd ed.), Jones and Bartlett Publishers, New Delhi.

6. Tremblay, J. P., and Manohar R., (2008). Discrete Mathematical Structures with Applications to Computer Science (1st ed.), McGraw-Hill Book Company, New Delhi.

22AEC201   **Environmental Studies**   Semester – II
                                                                    3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0   **Marks:** Internal: **40**   External: **60** Total: **100**
                                                  End Semester Exam: 3 Hours

Course Objectives (CO)
- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.
- To understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Outcomes (COs)
1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Unit I – Introduction - Environmental Studies & Ecosystems

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, Grassland Ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit II - Natural Resources - Renewable and Non-Renewable Resources

Natural resources - Renewable and Non – Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources - Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water resources - Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water. Use of alternate energy sources, growing energy needs, case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit III - Biodiversity and its Conservation

Levels of biological diversity - genetic, species and ecosystem diversity.   Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India. Biodiversity patterns (global, National and local levels). Hot-spots of biodiversity. India as a mega-diversity nation. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV - Environmental Pollution

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution. Nuclear hazards and human health risks. Solid waste management and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Case studies.

Unit V - Social Issues and the Environment

Concept of sustainability and sustainable development. Water conservation - Rain water harvesting, watershed management. Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture. Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act). International agreements (Montreal and Kyoto protocols). Resettlement and rehabilitation of project affected persons. Disaster management (floods, earthquake, cyclones and landslides). Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Human population growth: Impacts on environment, human health and welfare.

Suggested Readings
1. Rajagopalan, R. (2016). Environmental Studies: From Crisis to Cure, Oxford University Press**.**
2. Sing, J.S., Sing. S.P. and Gupta, S.R. (2014). Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
3. Mishra, D.D. (2010). Fundamental Concepts in Environmental Studies. S.Chand & Company Pvt. Ltd., New Delhi.
4. Uberoi, N.K.(2005). Environmental Studies. Excel Books Publications, New Delhi.

5. Anonymous. (2004). A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
6. Anubha Kaushik., and Kaushik, C.P. (2004). Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.

7. Arvind Kumar. (2004). A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
8. Singh, M.P., Singh, B.S., and Soma, S. Dey. (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House, New Delhi.
9. Tripathy. S.N., and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.). Vrianda Publications Private Ltd, New Delhi.
10. Verma, P.S., and Agarwal V.K. (2001). Environmental Biology (Principles of Ecology). S. Chand and Company Ltd, New Delhi.
11. Daniel, B. Botkin., and Edward, A. Keller. (1995). Environmental Science John Wiley and Sons, Inc., New York.
12. Odum, E.P., Odum, H.T. and Andrews, J. (1971). Fundamentals of Ecology. Philadelphia: Saunders.

		Semester – III
22ITU301	**Data Structures**	**4H – 4C**

Instruction Hours / week: L:4 T: 0 P: 0   **Marks:** Internal: **40**   External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the fundamental concepts of data structures
- To Learn linear data structures – lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms
- To develop application using data structures
- To design and implementation of various basic and advanced data structures.

Course Outcomes (COs)

Upon completion of this course, the student will be able to:
1. Choose appropriate data structure as applied to specified problem definition.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Identify different parameters to analyze the performance of an algorithm.
4. Apply concepts learned in various domains like DBMS, compiler construction etc.
5. Use linear and non-linear data structures like stacks, queues, linked list etc.
6. Illustrate various technique to for searching, Sorting and hashing

 Unit I

Introduction to Data Structures – Introduction- Basic terminologies of Data Organization- Concepts of Data Type- Data Structure Defined – Description of various Data Structures - Common operations on Data Structures **. Arrays & Matrices**: Introduction- Linear Arrays– Two dimensional Arrays – Matrices -Special and Sparse Matrices**.**

Unit II

List – Array based implementation – linked list implementation –– Singly linked lists- Circularly linked lists- Doubly-linked lists – Applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal). **Stack** Introduction – Operations – Applications – Evaluating arithmetic expressions- Conversion of   Infix to postfix expression .**Queue** Introduction – Operations – Circular Queue – Priority Queue – deQueue – applications of queues.

Unit III

Tree – Introduction- Tree Terminologies - Tree traversals -Binary Tree – Expression trees – applications   of trees– binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – Heap – Applications of heap.

Unit IV

Graphs Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

Unit V

Searching- Linear Search – Binary Search. **Sorting** – Bubble sort – Selection sort – Insertion sort – Shell sort – Radix Sort-Heap Sort-Quick Sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Suggested Readings

1. R. S. Salaria (2018)-Data Structures and Algorithms using C, Khanna Publishing, Fifth Edition.
2. Sartaj Sahni. (2016). Data Structures, Algorithms and applications in C++(2nd ed.). Universities Press.
3. Mark Allen Weiss. (2016). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
4. Reema Thareja,(2014) ―Data Structures Using C‖, Second Edition , Oxford University Press.
5. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). Wiley.
6. Thomas H. Cormen, Charles E. Leiserson,(2012) Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill.

Websites
1. http://en.wikipedia.org/wiki/Data_structure
2. http://www.cs.sunysb.edu/~skiena/224/lectures/
3. www.amazon.com/Teach-Yourself-Structures-Algorithms

Semester – III

22ITU302   **Relational Database Management Systems**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal: **40**   External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)

- To describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To have an introductory knowledge about the PL/SQL concept
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.

Course Outcomes (COs)

Upon completion of this course, students will be able to:
1. Demonstrate an understanding of the elementary features of RDBMS
2. Design conceptual models of a database using ER modeling for real life applications
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database
4. Able to develop structured query language (SQL) queries to create, read, update, and delete relational database
5. Retrieve any type of information from a data base by formulating complex queries in SQL.
6. Design efficient PL/SQL programs to access Oracle databases

Unit I – Introduction

Introduction to DBMS – Information-Data and Data Management-File-based data management – Database System - DBMS - Components of a DBMS- Database User-Database Architecture and Design- Data Abstraction - Physical and Logical Data Independence

Unit II - Data Models

Data Models-Introduction-Conceptual, Physical Models-Hierarchical Model - Network Model-Relational Model – E-R Model- Entity – Relationship (E-R) Modeling: Introduction – E-R Model -   Components of an E-R Model-Relationships- Relationships, E-R conventions-Composite Entities - Entity List-E-R diagrams, E-R Modeling Symbols

Unit III - Relational Database Design

Data Integrity, Constraints and Normalization: Introduction-Integrity   Constrains - Normalization-Keys-Relationships-Normalization   -   Keys-Relationships-First   Normal

Form(1NF)-Second Normal form(2NF) -Third Normal Form(3NF)- Boyce-Codd Normal Form (BCNF)

Unit IV - SQL Concepts

Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Joining Multiple Tables (Equi Joins), Joining a Table to itself (Self Joins)

Unit V - PL/SQL Concepts

Introduction to PL/SQL-Variable-Constants-Conditional Statements-Cursor-Implicit Cursors-PL/SQL Explicit Cursors - PL/SQL Procedures - PL/SQL Functions - PL/SQL Exception Handling PL/SQL Triggers

Suggested Readings

1. Elmasri Ramez and Navathe Shaman,(2019) 'Fundamentals of Database System', Pearson Education , Sixth Edition.

2. Abraham Silberschatz , Henry F.Korth and S.Sudarshan,(2018) 'Database System Concepts', Tata Mc Graw Hill,Sixth Edition.

3. Ivan Bayross,(2018),'SQL, PL/SQL the Programming Language of Oracle Paperback',BPB Publication, Fifth   Edition.

4. Parteek Bhatia,(2016)'PL/SQL for Beginners: A Simplified Approach (Kindle Edition)

5. C.J.Date, A.Kannan and S.Swamynathan,(2015) "An Introduction to Database Systems", Pearson Education ,Eighth Edition.

Websites

1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm

2. https://www.javatpoint.com/dbms-tutorial

3. https://www.javatpoint.com/dbms-sql-introduction

4. www.databasedir.com

5. http://plsql-tutorial.com/

		Semester – III
22ITU303	**Digital Computer Fundamentals**	**4H – 3C**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal: **40**   External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To know Structure and functions of Computer architecture and organizations.
- Observe the characteristics of various computer memory concepts.
- To understand the computer arithmetic and machine instructions.
- To know the concepts of logic circuits.
- To understand the parallel processing concepts.
- To understand the memory concepts.

Course Outcomes (COs)
Upon completion of this course, students will be able to:
1. Bridge the fundamental concepts of computers with the present level of knowledge of the students.
2. Perform number conversions from one system to another system.
3. Understand how logic circuits and Boolean algebra forms as the basics of digital computer.
4. Understanding the Mapping Expression as the basics of digital computer.
5. Demonstrate the building up of Sequential and combinational logic from basic gates.
6. Analyze the memory and I/O organizations.

Unit – I INTRODUCTION:

Application of Computer - Different types of Computer systems - Basic components of Digital Computer System - Programming Languages; Number Systems.

Unit – II BOOLEAN ALGEBRA AND GATE NETWORKS:

Fundamentals concepts of Boolean Algebra – Logical Multiplication AND Gates, OR Gates, and Inverters – Evaluation of logical Expressions – Basic Law of Boolean Algebra – Simplification of expressions – De Morgan's theorems – Basic Duality of Boolean Algebra - Derivation of a Boolean Expression.

Unit - III INTERCONNECTING GATES

Sum of products (SOP) and Products of sums (POS) – Derivation of products of sums expressions – Derivation of three Input variable expression – NAND gates and NOR gates - The Map method for simplifying expressions – Sub cube and covering – product of sums expressions – Don't cares.

Unit – IV COMBINATION OF LOGIC CIRCUITS

Half Adder- Full adder- Half Subtractor – Full Subtractor- Encoder-Decoder Multiplexer-Demultiplexer- -Sequential Circuits-Flipflops: Basic of Flipflops-SR Flipflops-JK Flipflops-D Flipflops-T Flipflops- Edge triggered Flipflops – Master-slave Flip-flops.

Unit -V REGISTER, COUNTER AND MEMORY UNIT

Register: Introduction- Types of Register- Counter: Introduction- Asynchronous or ripple counters- Asynchronous or ripple counters Memory: Introduction - Magnetic Memory - Optical Memory - Memory Addressing - ROMs, PROMs, EPROMs and EEPROM.

Suggested Readings

1. M.Morris Mano ,(2018),Digital Logic and Computer Design., 7th Edition Pearson India Education Services Pvt. Ltd Publisher.

2. William Stallings (2016),Computer Organization and Architecture 10th Edition © 2016 Pearson Education, Inc., Hoboken, NJ. Al.

3. Floyd Malvino ,Paul Albert & Leach ,Donald P,(2000),Digital Principles and Applications ,4th edition. TMH

4. Digital Computer Fundamentals. Thomas C.Bartee,(1991), 6th Edition T.M.H Publisher, New Delhi.

Websites

1. https://nios.ac.in/media/documents/vocational/CLS/Certificate_Course_in_Library_Science_english/M4_PDF/M4L1.pdf
2. https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf
3. https://www.javatpoint.com/digital-computers

	Semester – III
22ITU304A **Programming in Python**	**3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0   **Marks:** Internal: **40** External: **60**   Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the problem-solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python.
- To Implement Object Oriented Programming concepts in Python

Course Outcomes (COs)
Upon completion of the course, students will be able to
1. Develop algorithmic solutions to simple computational problems
2. Develop and execute simple Python programs.
3. Implement programs in Python using conditionals and loops for solving problems.
4. Deploy functions to decompose a Python program.
5. Process compound data using Python data structures.
6. Utilize Python packages in developing software applications.

Unit I - Python Overview, Data Types, Expressions

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types, Operators, and Expressions: Types – Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations

Unit II - Control Statements

Control Flow- if, if-elif-else, for, while break, continue, pass. Data Structures Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. Data Structures Lists – Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

Unit III - Algorithm and Data Structure, Strings

Stack, Queue, Tree, ordered list, Introduction to Recursion, Divide and Conquer Strategy, Greedy Strategy, Graph Algorithms. Regular Expression. Strings: String slices, immutability, string functions and methods, string module; Lists as arrays.

Unit IV - Functions and Modules

Functions – Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function- Global and Local Variables. Modules: Creating modules, import statements, from. The import statement, namespacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

Unit V - OOPS in Python

Object-Oriented Programming OOP in Python: Classes, ' self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions. Files and exception: text files, reading and writing files, format operator; command line arguments

Suggested Readings

1. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python: First Programs, Kenneth A. Lambert, Martin Osborne,(2018) "Fundamentals of Python: First Programs, Cengage Learning", second edition, ISBN 13:978-1337560092.
2. Karl Beecher,(2017) "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero,(2016) Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.
4. Allen B. Downey,(2016) ``Think Python: How to Think Like a Computer Scientist``, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, (http://greenteapress.com/wp/thinkpython/).
5. Timothy A. Budd,(2015),Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.
6. John V Guttag,(2013) ―Introduction to Computation and Programming Using Python``, Revised and expanded Edition, MIT Press.

Websites

1. https://www.learnpython.org/
2. https://www.codecademy.com/learn/learn-python
3. https://docs.python.org/3/tutorial/
4. https://runestone.academy/runestone/books/published/thinkcspy/index.html
5. http://www.w3schools.com
6. http://docs.python.org
7. http://www.tutorialspoint.com
8. http://www.learnpython.org
9. https://nptel.ac.in/courses/106106182/
10. http://172.16.25.76/course/view.php?id=1225

22ITU304B   **Scripting Language**   **3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0   **Marks:**Int :**40**   Ext : **60**   Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To classify the various Scripting Languages

- To learn client and server side scripting languages (Java script and AJAX, JSP)

- To create simple Web pages and provide client side validation.

- To create dynamic web pages using server side scripting

- To master the theory behind scripting and its relationship to classic programming

- To gain some fluency programming in JavaScript, AJAX, and related languages, to design and implement one's own scripting language.

Course Outcomes (COs)

At the end of the course, the student should be able to:

1. Define the CSS with its types and use them to provide the styles to the web pages at various levels.

2. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.

3. Use the JavaScript to develop the dynamic web pages.

4. Use server side scripting with JSP to generate the web pages dynamically.

5. Gain knowledge of client side scripting, validation of forms and AJAX programming.

6. Create applications by using the concepts like JSP and Servlet

Unit - I

Introduction To VB script: Introduction- Embedding VBScript Code in an HTML Document Comments-Variables- Operators-Procedures- Conditional Statements- Looping Constructs - VBScript Events- Objects and VBScript – Cookies.

Unit - II

Introduction to JavaScript: JavaScript- Introduction, simple programming, Obtaining User Input with prompt Dialogs, Operators (arithmetic, Decision making, assignment, logical, increment and decrement. Functions - program modules in JavaScript, programmer defined functions, function definition, Random-number generator, scope rules, global functions, recursion.

Unit - III

Functions, Arrays and Objects: JavaScript: Arrays, Objects - Math Object, String Object, Date Object, Boolean & Number Object, document and window Objects. Handling event using java script

Unit - IV

Client Side Technologies :AJAX– Evolution of AJAX – AJAX Framework – Web applications with AJAX – AJAX with PHP – AJAX with Databases- Ajax Client Server Architecture-XML Http Request Object-Call Back Methods.

Unit - V

Server Side Scripting- JSP : Servlet Overview – Life cycle of a Servlet – Handling HTTP request and response – Using Cookies – Session tracking – Java Server Pages – Anatomy of JSP – Implicit JSP Objects – JDBC – Java Beans – Advantages – Enterprise Java Beans – EJB Architecture – Types of Beans – EJB Transactions

Suggested Readings
1. Bryan Basham, Kathy Siegra, Bert Bates,(2018), "Head First Servlets and JSP", Second Edition.
2. Robert. W.Sebesta,(2017)"Programming the World Wide Web", Fourth Edition,Pearson Education
3. Jeffrey C. Jackson,(2016) "Web Technologies--A Computer Science Perspective", Pearson Education.
4. Deitel, Deitel, Goldberg,(2016) "Internet & World Wide Web How to Program", Fourth Edition, Pearson Education.
5. Uttam K Roy,(2015) "Web Technologies", Oxford University Press.

Websites
1. https://www.tutorialspoint.com/vbscript/index.htm
2. https://www.w3schools.com/js/
3. https://www.javatpoint.com/ajax-tutorial
4. https://www.javatpoint.com/servlet-tutorial
5. https://www.javatpoint.com/jsp-tutorial

Semester – III

22ITU311   **Data Structures-Practical**   **4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4   Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.
- To improve the logical ability

Course Outcomes (COs)
After the completion of this course, a successful student will be able to:
1. Choose appropriate data structure as applied to specified problem definition.
2. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Identify different parameters to analyze the performance of an algorithm.
4. Apply concepts learned in various domains like DBMS, compiler construction etc.
5. Use linear and non-linear data structures like stacks, queues, linked list etc.
6. Illustrate various technique to for searching, Sorting and hashing

List of Programs

1. Write a program to search an element from a list. Give user the option to perform Linear and Binary search.

2. Give user the option to perform sorting using Insertion sort, Bubble sort and Selection sort.

3. Implement singly Linked List Include functions for insertion, deletion and search of a number, reverse the list.

5. Perform Stack operations using Linked List implementation.

6. Perform Stack operations using Array implementation.

7. Perform Queues operations using Array implementation.

7. Perform Queues operations using Linked List.

8. WAP to scan a polynomial using linked list and add two polynomial.

9. WAP to create a Binary Search Tree and include following operations in tree:

      (a) Insertion

      (b) Deletion

      (c) Search a no. in BST

10. Program to implement Graph Traversal Techniques.

Suggested Readings

1. R. S. Salaria (2018)-Data Structures and Algorithms using C, Khanna Publishing, Fifth Edition.
2. Sartaj Sahni. (2016). Data Structures, Algorithms and applications in C++(2nd ed.). Universities Press.
3. Mark Allen Weiss. (2016). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
4. Reema Thareja,(2014) ―Data Structures Using C‖, Second Edition , Oxford University Press.
5. Goodrich, M., & Tamassia, R. (2013). Data Structures and Algorithms Analysis in Java(4th ed.). Wiley.
6. Thomas H. Cormen, Charles E. Leiserson,(2012) Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill.

Websites

1. http://en.wikipedia.org/wiki/Data_structure

2. http://www.cs.sunysb.edu/~skiena/214/lectures/

3. www.amazon.com/Teach-Yourself-Structures-Algorithms

Semester – III

22ITU312   Relational Database Management Systems-Practical   3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal: **40** External: **60**   Total: **100**

End Semester Exam: 3 Hours

Course Outcomes (COs)
- To describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.

Course Outcomes (COs)
Upon completion of the course, students will be able to
1. Explain the features of database management systems and Relational database.
2. Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
4. Retrieve any type of information from a data base by formulating complex queries in SQL.
5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
6. Build indexing mechanisms for efficient retrieval of information from a database

List of Programs
1. To implement Data Definition language
2. To implement Data Manipulation language
3. To implementation on DCL and TCL
4. To implement the following Constraints
     (a). Primary key
     (b). Foreign Key
     (c). Check
     (d). Unique
     (e). Null
     (f) Not null

5. Create a table with following fields:
    Employee table:

Field name	Constraint	Type	Size
Employee_no	Primary key	Character	6
Employee_name		Character	30
Address		Character	25
Designation		Character	15
Dob		Date	
Gender	Check	Character	1
Doj		Date	
Salary		Number	10,2

Queries:
a) Display name of the employees whose salary is greater than "10,000".
b) Display the details of employees in ascending order according to Employee Code
c) Display the details of employees earning the highest salary
d) Display the names of employees who earn more than "Ravi".

6. Create table named Student with following fields and insert the values:

Field name	field type	field size
Student Name	Character	15
Gender	Character	6
Roll No.	Character	10
Department Name	Character	15
Address	Character	25
Percentage of marks	Number	4,2

Queries:
a) Calculate the average mark percentage of the students
b) Display the names of the students whose percentage marks are greater than 80%
c) Display the details of the students who got the highest percentage of marks
d) Display the details of the students whose mark percentage between 50 and 70
e) Display the details of the students whose mark percentage is greater the mark percentage of Roll No=12CA01

7. Create a table with following fields:
   Staff table:

Field name	Constraint	Type	Size
Staff_no	Primary key	Character	6
Staff_name		Character	30
Dob		Date	
Dept_code	Foreign key	Character	4
Designation		Character	15
Basic		Number	7,2

Department table:

Field name	constraint	Type	Size
Dept_code	Primary key	Character	4
Dept_name		Character	30

Execute the following queries:
1. To list the staff who joined 2 years back.
2. To list the staff in computer science dept.
3. To list the staff_name and the dept_name in which he/she works.
4. To list the maximum and minimum salary in each dept.
5. To list the dept along with the total amount spent on salary
6. To list the name of the employees who draw the salary more than the average salary.

8. Create a table with the following fields:
Book table:

Field name	Constraint	Type	Size
Access_no	Primary key	Character	6
Title		Character	30
Author		Character	30
Publisher		Character	30
Subject		Character	10
Price		Number	6,2

Execute the following queries:
1. The title of C and C++ books.
2. The books written by a particular author.
3. The books which costs between Rs.300/- and Rs.500/-
4. The number of books available in each subject.
5. The books in the decreasing order of the cost.

9. Create a table with the following fields:
Account table:

Field name	Constraint	Type	Size
Acc_no	Primary key	Number	4
Cust_name		Varchar2	30
Branch_name		Varchar2	30
Cust_city		Varchar2	30

Borrower table:

Field name	Constraint	Type	Size
Acc_no	Foreign key	Number	30
Branch_name		Varchar2	30
Amount		Number	8,2

Write queries to perform different types of Join.

10.   Write a PL/SQL block to create and handle User Defined Exception
clientmaster

Field name	Constraint	Type	Size
Client_id		Number	6
Client_name		Varchar2	30
Address		Varchar2	50
Phone		Number	10
Balance		Number	10,2

11. Create table with following fields:
Product table:

Field name	Constraint	Type	Size
Product_code	Primary key	Varchar2	7
Product_name		Varchar2	30
Price		Number	6,2
Quantity		Number	4

Vendor table:

Field name	Constraint	Type	Size
Vendor_name		Varchar2	30
Vendor address		Varchar2	30
Product_code	Foreign Key	Varchar2	7

Create a Trigger to fire when the Record is deleted and inserted.

12. Write a PL/SQL trigger to update the records while deleting the one record in another table.
Voters_master:

Field name	Constraint	Type	Size
Voterid	Primary key	Number	5
Name		Varchar2	30
Ward_no	Primary Key	Number	4
Dob		Date	
Address		Varchar2	150

New_list

Field name	Constraint	Type	Size
Voterid		Number	5
Ward_no		Number	4
Name		Varchar2	30
Description		Character	50

13. Create a table to store the salary details of the employees in a company. Declare the Cursor id to contain empno, employee name and net salary. Use cursor to update the employee details.

Salary:

Field name	Constraint	Type	Size
Emp_no	Primary key	Number	4
Emp_name		Varchar2	30
Designation		Varchar2	25
Dept		Varchar2	30
Basic		Number	5

14. Create a table stock contains the itemcode varchar2(10), itemname varchar2(50), current_stocknumber(5), date_of_last_purchase date. Write a stored procedure to seek for an item using itemcode and delete it, if the date of last purchase is before 1 year from the current date. If not, update the curent stock.

15. Create a Package in PL/SQL

Suggested Readings
1. Elmasri Ramez and Navathe Shaman,(2019) 'Fundamentals of Database System', Pearson Education , Sixth Edition.

2. Abraham Silberschatz , Henry F.Korth and S.Sudarshan,(2018) 'Database System Concepts', Tata Mc Graw Hill,Sixth Edition.

3. Ivan Bayross,(2018),'SQL, PL/SQL the Programming Language of Oracle Paperback',BPB Publication, Fifth   Edition.

4. Parteek Bhatia,(2016)'PL/SQL for Beginners: A Simplified Approach (Kindle Edition) .

5. C.J.Date, A.Kannan and S.Swamynathan,(2015) "An Introduction to Database Systems", Pearson Education ,Eighth Edition.

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1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.javatpoint.com/dbms-sql-introduction
4. www.databasedir.com
5. http://plsql-tutorial.com/

22ITU313   **Web Designing-Practical**

Semester – III
3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3   **Marks:** Internal : **40**   External : **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the concepts and architecture of the World Wide Web.
- To understand and practice markup languages
- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- To understand and practice embedded dynamic scripting on client-side Internet Programming
- To gain some fluency programming in HTML, ASP, JavaScript and related languages, to design and implement one's own scripting language.

Course Outcomes (COs)
Upon Completion of the course, the students will be able to
1. Design web pages.
2. Use technologies of Web Programming.
3. Apply object-oriented aspects to Scripting.
4. Create a basic website using HTML and Cascading Style Sheets.
5. Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
6. Develop web pages using ASP, JSP and VBScript, embedded dynamic scripting on client-side Internet Programming

List of Programs
1. Create HTML document with following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Brakes, Horizontal Line, Blinking text as well as marquee text.
2. Create HTML document with Ordered and Unordered lists, Inserting Images, Internal and External linking
3. Create HTML document with Table

4. Create Form with Input Type, Select and Text Area in HTML.
5. Create an HTML containing Roll No., student's name and Grades in a tabular form.
6. Create an HTML document (having two frames) which will appear as follows

About	This frame would show the contents according to the link clicked by the user on the left frame.
Department 1	
Department 2	
Department 3	

7. Create an HTML document containing horizontal frames as follows

Department Names (could be along with Logos)
Contents according to the Link clicked

8. Create a website of 6 – 7 pages with different effects as mentioned in above problems.
9. Create a form using HTML which has the following types of controls:
      V. Text Box
      VI. Option/radio buttons
      VII. Check boxes
      VIII. Reset and Submit buttons

List of Programs using JavaScript: Create event driven program for following:
10. Print a table of numbers from 5 to 15 and their squares and cubes using alert.
11. Print the largest of three numbers. 81
12. Find the factorial of a number n.
13. Enter a list of positive numbers terminated by Zero. Find the sum and average of these numbers.
14. A person deposits Rs 1000 in a fixed account yielding 5% interest. Compute the amount in the account at the end of each year for n years.
15. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.

Suggested Readings

1. Paul McFedries ,(2018)"Web Coding & Development All-in-One For Dummies",

2. Randy Connolly, Ricardo Hoar ,(2017)"Fundamentals of Web Development" ,

3. Joel sklar (2015),Principles of web design., ,sixth edition.

4. Jon Duckett,(2014) ,"HTML and CSS: Design and Build Websites"

5. Thomas A Powell, Fritz Schneider,(2013) "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill.

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1. http://www. freeCodeCamp Guides.com/
2. http://www. Codrops CSS Reference/
3. https://developer.mozilla.org/enUS/docs/Web/JavaScript/Guide.
4. http://www.w3schools.com.

Semester – III

22ITU314A	**Programming in Python-Practical**	**3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

Course Outcomes (COs)
Upon completion of the course, students will be able to
1. Develop algorithmic solutions to simple computational problems
2. Read, write, execute by hand simple Python programs.
3. Structure simple Python programs for solving problems.
4. Decompose a Python program into functions.
5. Represent compound data using Python lists, tuples, dictionaries.
6. Read and write data from/to files in Python Programs.

List of Programs
1. Write a python program using Control statements

2. Write a python program using Functions and String Operations

3. Write a python program using List, Tuples and List comprehensions

4. Write a python program using Inheritance

5. Write a python program using Synchronization

6. Write a python program using Text Files

7. Write a python program using Graphical user Interfaces

8. Write a python program using Exceptional Handling

9. Write a python program using Classes and Objects

10. Write a python program using Chat Applications

Suggested Readings
1. Kenneth A. Lambert, Martin Osborne,(2018) "Fundamentals of Python: First Programs, Cengage Learning", second edition, ISBN 13:978-1337560092.
2. Karl Beecher,(2017) "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited.

3. Robert Sedgewick, Kevin Wayne, Robert Dondero,(2016) Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.

4. Allen B. Downey,(2016) ``Think Python: How to Think Like a Computer Scientist'', 2nd edition,   Updated   for   Python   3,   Shroff/O'Reilly   Publishers, (http://greenteapress.com/wp/thinkpython/).

5. Timothy A. Budd,(2015),Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.

6. John V Guttag,(2013) ―Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press.

Websites

1. https://www.learnpython.org/
2. https://www.codecademy.com/learn/learn-python
3. https://docs.python.org/3/tutorial/
4. https://runestone.academy/runestone/books/published/thinkcspy/index.html

22ITU314B   **Scripting Language -Practical**   Semester – III
                                                                   3H – 1C

Instruction Hours / week: L: 0T: 0 P: 3 Marks: Internal: **40**   External: **60**   Total: **100**
                                                      End Semester Exam: 3 Hours

Course Objectives (CO)
- To classify the various Scripting Languages
- To learn client and server side scripting languages (Java script and AJAX, JSP)
- To create simple Web pages and provide client side validation.
- To create dynamic web pages using server side scripting
- To master the theory behind scripting and its relationship to classic programming
- To gain some fluency programming in JavaScript, AJAX, and related languages, to design and implement one's own scripting language.

Course Outcomes (COs)
At the end of the course, the student should be able to:
1. Define the CSS with its types and use them to provide the styles to the web pages at various levels.
2. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
3. Use the JavaScript to develop the dynamic web pages.
4. Use server side scripting with JSP to generate the web pages dynamically.
5. Gain knowledge of client side scripting, validation of forms and AJAX programming.
6. Create applications by using the concepts like JSP and Servlet.

List of Programs

1. Create Application form using various text formats.

2. Create UNIVERSITY website using HTML tags.

3. Create a table using HTML.

4. Display your information using form controls.

5. Create style sheets with the style elements.

6. Create calculator format using java script.

7. Create an array of 10 numbers and sort them using javascript.

8. String manipulation using string object.

9. Add a simple script using Click event.

10. Create Employee details using schemas.

11. Create our department details using CSS.

12. Create Payroll system using XSL.

13. Changing image using mouseover event.

14. Create a website for a newspaper.

15. Design and apply your application form for course enrolment using Javascript.

Suggested Readings

1. Bryan Basham, Kathy Siegra, Bert Bates,(2018), "Head First Servlets and JSP", Second Edition.

2. Robert. W.Sebesta,(2017)"Programming the World Wide Web", Fourth Edition,Pearson Education

3. Jeffrey C. Jackson,(2016) "Web Technologies--A Computer Science Perspective", Pearson Education.

4. Deitel, Deitel, Goldberg,(2016) "Internet & World Wide Web How to Program", Fourth Edition, Pearson Education.

5. Uttam K Roy,(2015) "Web Technologies", Oxford University Press.

22SSD301   **Soft Skill Development -I**

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Semester – III
2H – 1C

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Instruction Hours / week: L: 2 T: 0 P: 0   Marks: Internal: **100**   External: **0**   Total: **100**

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End Semester Exam: 3 Hours

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Course Objectives
- To understand the main concepts of Employability and Skill Development
- To escalate the knowledge in Analytical and Mathematical Skills
- To develop and nurture the soft skills for the students through individual and group activities
- To stimulate the all-round development of the students by emphasizing on Soft skills and Aptitude
- To embellish self-esteemed individuals by mastering inter-personal skills, team management skills and leadership skills
- To steer and bestow right module of training that meets the industry needs and ameliorate their employability skills.

Course Outcomes (COs)
Upon culmination of this course the students will be able to:
1. Understand the basic concepts of Quantitative Aptitude and Logical reasoning.
2. Solve the real-time problems to accomplish job functions easily.
3. Understand the basic grammar and utilize it for their language enhancement.
4. Communicate in genuine circumstances acquiring basic grammatical structure and vocabulary.
5. Articulate efficiently with others as well within a group or a team catalyzing in building a rapport with the team members.
6. Intensify their professionalism at work by acquiring knowledge on job roles and responsibilities.

UNIT I- BASIC APPROACHES TO NUMBERS

- Number system
- Problems on numbers
- Number series
- Simplifications

UNIT II- PROBLEMS RELATED TO TIME

- Time and work
- Pipes and cisterns
- Time, speed, distance and problems on trains
- Boats and streams
- Clocks
- Calendar

UNIT III- PROBLEMS ON PARTITIONS

- Ratio and Proportion
- Average
- Inequalities
- Allegation and Mixture
- Elementary Statistics

UNIT IV- INTRODUCTION TO GRAMMAR AND PREREQUISITES FOR INTERVIEW

- Parts of Speech
- Tense
- Subject Verb Agreement
- Articles and Prepositions
- Resume Building
- Self-Introduction

UNIT V- EMPHASIZING THE FUNCTIONS OF GRAMMAR AND LIFE SKILLS

- Active and Passive Voice
- Direct and Indirect Speech
- Idioms and Phrases
- Degrees of Comparison and Conditional clause
- Prefix, suffix and Question tags
- Group discussion
- Extempore Speech

Suggested Readings

1. Quantitative aptitude for competitive exams by S.Chand, Dr. R.S. Aggarwal
2. A modern Approach to Logical Reasoning by S.Chand, Dr. R.S. Aggarwal
3. Verbal Aptitude for competitive exams by S. Chand, Dr. R.S. Aggarwal
4. Objective English for Competitive Examinations by Edgar Thorpe, Showick Thorpe
5. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P.SREEHARI, J SAVITHRI.

22ITU391   **Internship**   **Semester – III**
                                                                              0H – 2C

Instruction Hours / week: L: 0 T: 0 P: 0   Marks: Internal: **100**   External: 0   Total: **100**
                                                                 End Semester Exam: 3 Hours

22ITU401   **Operating Systems**   Semester – IV
                                                                          4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal : **40** External : **60**   Total: **100**
                                                          End Semester Exam : 3 Hours

Course Objectives (CO)

- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To understand the structure and organization of the file system

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Describe the important computer system resources and the
2. Perform the role of operating system in their management policies and algorithms.
3. Understand the process management policies and scheduling of processes by CPU
4. Evaluate the requirement for process synchronization and coordination handled by operating system
5. Describe and analyze the memory management and its allocation policies.
6. Identify use and evaluate the storage management policies with respect to different storage management technologies, identify the need to create the special purpose operating system.

Unit I- Introduction to Operating System

Introduction-Basic OS Functions-Types of OS: Multi programming Systems-Batch Systems-Time Sharing Systems- Real Time Systems. Computer System Structures: Computer System operation-I/O Structure-Storage Structure- Storage Hierarchy.

Unit II-Operating System Structures and Process Management:

System Components-Operating System Services-System Calls-System Programs-System Structures. Processes**:** Process Concept- Process Scheduling-Inter Process Communication. Threads: Multithreading Models- Thread issues.

Unit III- Process Management

CPU Scheduling: Basic concepts- Scheduling Algorithm-Multiple-preprocessor scheduling-real time scheduling**. Process Synchronization:** Critical section problem-Synchronization

hardware-semaphore. **Deadlocks:** System Model- Deadlock characterization– Dead lock Prevention-Deadlock Avoidance – Deadlock Recovery.

Unit IV- Storage Management

Memory Management: Swapping- Paging-Segmentation- Segmentation with Paging. **Virtual Memory**: Demand Paging-Process Creation-Page replacement Allocations of Frame-Thrashing.

File System Interface: File Concept- Accept Method-Directory Structure-File system monitoring-file sharing.

Unit V-Protection and Security

Protection: Goals of Protection-Domain of Protection-capability based systems-Language based protection

Security: Security Problem-User Authentication-Program Threats-System Threats-Security systems and facilities.

Suggested Readings

1. Silberschatz, A ., Galvin, P.B. , &Gagne,G.(2018). Operating Systems Concepts, 10thed..New Delhi: John Wiley Publications.

2. Stallings, W.(2016). Operating Systems, Internals & Design Principles (7thed.). New Delhi: Prentice Hall of India.

3. Jose M Garrido , Richard Schlesinger Kenneth Hoganson (2015). Principles of Modern Operating Systems,2nd edition,Library of Congress Cataloging-in-Publication Data.

Websites

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/

2. www.clarkson.edu/~jnm/cs644

3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

4. www.nptel.ac.in/operating systems.

5. http://172.16.25.76/course/view.php?id=1906

Semester – IV

22ITU402   **Software Engineering**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal : **40** External : **60**   Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
- Expose the criteria for test cases.
- Be familiar with test management and test automation techniques
- Implement a given software design using sound development practices.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Develop software projects based on current technology, and test the software using testing tools.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

Unit I – Introduction

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

Unit II - Requirement Analysis

Initiating Requirement Engineering Process- Requirement Analysis and Modeling Techniques- Flow Oriented Modeling- Need for SRS- Characteristics and Components of SRS- Software Project Management: Estimation in Project Planning Process, Project Scheduling.

Unit III - Risk Management & Design Engineering

Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, Metrics for Process and Projects- Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design.

Unit IV - Testing Strategies & Tactics
Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing- Performance Testing-Stress Testing – Scalability Testing – Soak Testing-Spike Testing. Agile Testing Functional testing concepts, Equivalence class partitioning, Boundary value analysis, Decision tables, Random testing, Error guessing.

Unit V - Automation Testing Basics
Introduction of selenium- Selenium components- Overview of the Testing framework- Selenium Architecture- Selenium Features- Selenium IDE- IDE-Features- IDE Commands - IDE-First Test Case-Selenium Web Driver- Web Driver-Architecture- Web Driver-Features- WebDriver Commands- Locating Strategies

Suggested Readings
1. Pressman, R.S. (2019). Software Engineering: A Practitioner's Approach. 7th edition. New Delhi: McGraw-Hill.
2. Jalote, P. (2018). An Integrated Approach to Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
3. Aditya P. Mathur (2018)., Foundations of Software Testing _ Fundamental Algorithms and   Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education.
4. Aggarwal, K.K., & Singh, Y. (2017). Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
5. Sommerville, I. (2016). Software Engineering. 8th edition. New Delhi: Addison Wesley.
6. Lisa Crispin and Janet Gregory.(2015) Agile Testing: A Practical Guide for Testers and Agile Teams

Websites
1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. https://www.javatpoint.com/selenium-tutorial
4. https://nptel.ac.in/courses/106105087/
5. https://qascript.com/free-selenium-webdriver-ebook/

Semester – IV

22ITU403	**Operations Research**	4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal: **40**   External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)

This course enables the students to
- To learn the basic concepts and applications of linear programming.
- To impart knowledge in concepts and tools of Operations Research.
- To know the constructive techniques to make effective business decisions
- Define and formulate linear programming problems and appreciate their limitations
- To Identify and develop operational research models from the verbal description of the real system
- To Solve network models like the shortest path, minimum spanning tree, and maximum flow problems

Course Outcomes (COs)

Upon successful completion of the course, students will be able to
1. Understand the basic concepts and application of operation research in various fields.
2. Understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively
3. Define and formulate linear programming problems and appreciate their limitations
4. Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry
5. Identify and develop operational research models from the verbal description of the real system
6. Solve network models like the shortest path, minimum spanning tree, and maximum flow problems

Unit I

Linear Programming - Mathematical Model assumption of linear Programming –Graphical method - Principles of Simplex method- Big-M Method- Duality in LPP.

Unit - II

Transportation Model: Introduction – Mathematical Formulation –Finding Initial Basic Feasible Solutions – Optimum Solution for Non degeneracy and Degeneracy Model - Unbalanced Transportation Problems and Maximization case in Transportation Problem.

Unit- III

The Assignment problem : Mathematical Formulation of the Problem – Hungarian Method – Unbalanced Assignment Problem- Maximization Case in Assignment Problem - Travelling Salesman Problem.

Queuing Theory : Introduction – Characteristics of Queuing System. Problems in $(M/M/1):(\infty/FIFO)$ and $(M/M/1):(N/FIFO)$ models .

Unit - IV

Inventory Control: Introduction – Costs involved in Inventory – Deterministic EOQ Models – Purchasing Model without and with Shortage, Manufacturing Model without and with Shortage - Price Break.

Unit V

PERT AND CPM

Introduction - Network scheduling by PERT / CPM – Network and basic components – Rules of Network construction – Time calculation in Networks – CPM. PERT – PERT calculations – Cost Analysis – Crashing the Network – Problems.

Suggested Readings

1. S.D. Sharma (2017), Operations Research Theory, Methods & Applications, Kedar Nath Ram Nath Publications, India.
2. G. Srinivasan (2017) ,Operations Research: Principles and Applications, PHI, NewDelhi.
3. Prem Kumar Gupta and D. S. Hira (2014), Operations Research , S. Chand & Company Ltd, Ram Nagar, New Delhi.
4. Hamdy A. Taha (2012), Operations Research-An Introduction, Nineth edition, published by Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
5. Kandiswarup, P. K. Gupta and Man Mohan (2011), Operations Research, 12th Revised edition, S. Chand & Sons Education Publications, New Delhi.

Websites

1. https://youtu.be/vUMGvpsb8dc
2. https://youtu.be/ItOuvM2KmD4

	Semester – IV
22ITU404A .Net Programming	**3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0   Marks: Internal : **40** External : **60**   Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)
- To Create windows forms using arrays and flow control statements.
- To Learn to use Basic windows controls using Visual Basic.Net
- To Learn to use the classes and namespaces in the .NET Framework class library.
- To Create Multiple Document Interface application..
- To assemble multiple forms, modules, and menus into working VB.NET solutions
- To Compare subroutines, Functions and Events

Course Outcomes (COs)
Upon completion of this course the students will be able to:
1. Develop Windows based applications using Visual Basic.Net
2. Learn various tools in .net applications
3. Implement ADO.Net concept in VB.Net
4. Develop simple application using different controls –Facilitating user interaction.
5. Analyze error prone code.
6. Apply techniques to develop error-free software

Unit I - Introduction

Introduction to .NET: .NET framework features & architecture, CLR, common Type system, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB .Net – Menu bar, Tool bar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object browser. The environment: Editor tab, format tab, general tab, docking tab. Visual development & event driven programming – Methods and events.

Unit II - VB .Net Language

The VB .Net Language: The VB .Net Language – Variables- declaring variables, Data type of variables, forcing variables declarations, scope & lifetime of a variable, constants, arrays, types of arrays, control array, Structure programming – Modularity – Information hiding – abstraction – events – subroutines and functions – message box – input box. Control flow statement: conditional statement, loop statement.

Unit III - Basic Windows Controls

Textbox Control- List Box, Checked List Box-Scrollbar and Track Bar Controls-More Windows Control-The common Dialog Controls-The Rich Text Box Control - Handling Strings, characters and Dates. The TreeView and ListView Controls: Examining the Advanced Controls-The TreeView Control-The ListView Control.

Unit IV - Working with Forms

Working with Forms : Loading, showing and hiding forms, controlling One form within another. Using MDI form. Working with Menus: creating menu, inserting, deleting, assigning short cut keys, pop up menu .Windows Form Control (with Properties, Methods and events). Built-in Dialog Box: OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog, PrintDialog, Printing.

Unit V- Database programming with ADO .Net

Database programming with ADO .Net: overview of ADO, from ADO to ADO .Net, accessing data using server explorer. Creating connection, command, data adapter and data set with OLEDB and SQLDB. Display data on data bound controls, display data on a data grid. Generate reports using CrystalReportViewer.

Suggested Readings

1. Evangelos Petroutsos (2019) , Mastering Visual Basic.Net, BPB Publications, New Delhi.

2. Ying Bai, Practical Database Programming with Visual Basic.Net (2018). 2nd Edition, John Wiley & Sons Publication, Canada

3. Shirish Chavan. (2017), Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.

4. Thearon Willis, Bryan Newsome (2016),Beginning Visual Basic, Wrox Publication, New Delhi.

5. Steven Roman ,(2016),VB.Net in Nutshell , 2nd Edition., Paul Lomax, Oreilly.

Websites

1. www.microsoft.com/NET/

2. www.en.wikipedia.org/wiki/.net

3. www.vbtutot.com

4. https://freevideolectures.com/course/3002/dot-net-tutorial

5. https://www.nptelvideos.com/video.php?id=1760&c=21

6. http://172.16.25.76/course/view.php?id=370

22ITU404B   **Android Programming**

Instruction Hours / week: L: 3 T: 0 P: 0   Marks: Internal: **40** External : **60**   Total: **100**
                                                              End Semester Exam : 3 Hours

Course Objectives (CO)
- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To explore Mobile security issues.

Course Outcomes (Cos)
Upon completion of this course the students will be able to:
1. Analyze the Architecture and features of Android with another Mobile Operating System.
2. Evaluate the standard of Kotlin language for developing Android Applications
3. Apply knowledge for creating user Interface and develop activity for Android App.
4. Evaluate the user interface architecture of Android for developing Android Apps
5. Understand the implementation of SQLite database operations with Android.
6. Design and implement Database Application and Content providers.

Unit I -Introduction

History of Android, Introduction to Android Operating Systems-Android Development Tools-Android Debug Bridge-Android Software Development Kit-Android Virtual Device- Android Architecture-Comparison between Android and Apple IOS-Android Application Components.

Unit II - OOPs Concepts of Kotlin Language

Inheritance-Polymorphism-Interfaces- Abstract class-Threads- Overloading and Overriding-Exception Handling- Kotlin APIs for Android.

Unit III -Creating a Hello World project

Role of XML in Android Development -Working with the AndroidManifest.xml -Features of Android Eclipse and Android Studio -Android Services - Android Service lifecycle – Android Foreground service -Android Background service.

Unit IV -User Interface Architecture of Android

Application context- intents- Activity life cycle- Fragment Life Cycle. **User Interface Design:** Layout Manager- Form widgets- Text Fields- Layouts- Button control- toggle buttons- Spinners (Combo boxes)-Images- Menus-Dialog.

Unit V -Introduction to SQLite database

Connecting SQLite with Android-SQLite Data Types-Cursors and content values-SQLite Open Helper-Adding- Updating and Deleting Content using SQLite Database.

Suggested readings

1. Peter Spath (2019). Learn Kotlin for Android Development, APress Publications

2. James C.Sheusi,(2018). Android application development for Java programmers, Cengage Learning.

Websites

1. http://www.developer.android.com

2. http://developer.android.com/about/versions/index.html

3. http://developer.android.com/training/basics/firstapp/index.html

4. http://developer.android.com/guide/components/activities.html

5. http://developer.android.com/guide/components/fundamentals.html

6. http://developer.android.com/guide/components/intents-filters.html.

7. http://developer.android.com/training/multiscreen/screensizes.html

8. http://developer.android.com/guide/topics/ui/controls.html

9. http://developer.android.com/guide/topics/ui/declaring-layout.html

10. http://developer.android.com/training/basics/data-storage/databases.html

11. https://nptel.ac.in/courses/106106156/

12. http://172.16.13.33/course/view.php?id=606

22ITU411   **Operating Systems-Practical**   Semester – IV
3H – 2C

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC. To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To understand the structure and organization of the file system

Course Outcomes (COs)
After the completion of this course, a successful student will be able to:
1. Describe the important computer system resources and the
2. Perform the role of operating system in their management policies and algorithms.
3. Understand the process management policies and scheduling of processes by CPU
4. Evaluate the requirement for process synchronization and coordination handled by operating system
5. Describe and analyze the memory management and its allocation policies.
6. Identify use and evaluate the storage management policies with respect to different storage management technologies, identify the need to create the special purpose operating system.

List of Programs

1. Write a program (using fork() and/or exec() commands) where parent and child execute:

   a) same program, same code.

   b) same program, different code.

   c) before terminating, the parent waits for the child to finish its task.

2. Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)

3. Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)

4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.

5. Write a program to copy files using system calls.

6. Write program to implement FCFS scheduling algorithm.

7. Write program to implement Round Robin scheduling algorithm.

8. Write program to implement SJF scheduling algorithm.

9. Write program to implement non-preemptive priority based scheduling algorithm.

10. Write program to implement preemptive priority based scheduling algorithm.

11. Write program to implement SRJF scheduling algorithm.

12. Write program to calculate sum of n numbers using thread library.

13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

Suggested Readings

1. Silberschatz, A ., Galvin, P.B. , &Gagne,G.(2018). Operating Systems Concepts, 10thed..New Delhi: John Wiley Publications.

2. Stallings, W.(2016). Operating Systems, Internals & Design Principles (7thed.). New Delhi: Prentice Hall of India.

3. Jose M Garrido , Richard Schlesinger Kenneth Hoganson (2015). Principles of Modern Operating Systems,2nd edition,Library of Congress Cataloging-in-Publication Data.

Web Sites
1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

	Semester – IV
22ITU412 **Software Engineering-Practical**	**4H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 4   Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)
- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
- Expose the criteria for test cases.
- Be familiar with test management and test automation techniques
- Implement a given software design using sound development practices.

Course Outcomes (COs)
Upon completion of this course the students will be able to:
1. Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.
2. Apply systematic procedure for software design and deployment.
3. Analyze a problem and identify and define the computing requirements to the problem.
4. Formulate appropriate testing strategy for the given software system.
5. Develop software projects based on current technology, and test the software using testing tools.
6. Express and understand the importance of negotiation, effective work habits, leadership, and good communication with stakeholders, in written and oral forms, in a typical software development environment.

List of Programs

S. No	Practical Title
1.	- Problem Statement - Process Model
2.	Requirement Analysis: - Creating a DataFlow - Data Dictionary, UseCases
3.	Project Management: - Computing FP - Effort - Schedule, Risk Table, Timelinechart
4.	Design Engineering: - Architectural Design - Data Design, Component LevelDesign
5.	Testing: Basis Path Testing

Sample Projects: [ANY 3]

1. Criminal Record Management: Implement a criminal record management system for jailers, police officers and CBI officers.
2. Patient Appointment and Prescription Management System.
3. Organized Retail Shopping Management Software.
4. Online Hotel Reservation Service System.
5. Examination and Result computation system
6. Automatic Internal Assessment System

Using Testing Tool: (Selenium) [ANY 5]

1. Using Selenium IDE, write a test suite containing minimum 4 test cases.
2. Conduct a test suite for any two websites.
3. Write and test a program to login a specific webpage
4. Write Selenium Web driver Script using java
5. Create Locators in Selenium using IDE
6. Find Element and Find Elements in Web using Selenium WebDriver
7. Program to Select Checkbox and Radio Button in Selenium WebDriver

Suggested Readings

1. Pressman, R.S. (2019). Software Engineering: A Practitioner's Approach. 7th edition. New Delhi: McGraw-Hill.
2. Aditya P. Mathur (2018)., Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education.
3. Jalote, P. (2018). An Integrated Approach to Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
4. Aggarwal, K.K., & Singh, Y. (2017). Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
5. Sommerville, I. (2016). Software Engineering. 8th edition. New Delhi: Addison Wesley.
6. Lisa Crispin and Janet Gregory.(2015) Agile Testing: A Practical Guide for Testers and Agile Teams

Websites

1. www.testinggeek.com
2. www.softwaretestinghelp.com
3. www.softwaretestinginstitute.com
4. https://www.javatpoint.com/selenium-tutorial
5. https://nptel.ac.in/courses/106105087/

Semester – IV

22ITU413   **Multimedia Tools-Practical**   **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives (CO)
- To equip individuals with knowledge and skills to use GIMP for photo retouching, image composition, image authoring, and animation amongst other
- To learn how to edit images with gimpshop
- To give you some practical experience of some of the main features of GIMP: the Gnu Image Manipulation Program, a nice and free package for image manipulation.
- To take a look at a few useful graphics creation techniques, suitable for multimedia graphics.
- To help your understanding of colour and colour models.
- To practically illustrate some of the graphics material covered in lectures so far and that you will encounter in future graphics lectures, particularly different graphics file formats.

Course Outcomes (COs)
Upon successful completion of this course, the student will be able to:
1. Create a well-designed, interactive Web site with respect to current standards and practices
2. Demonstrate in-depth knowledge in an industry-standard multimedia development tool and its associated scripting language
3. Determine the appropriate use of interactive verses standalone Web applications
4. Create time-based and interactive multimedia components
5. Identify issues and obstacles encountered by Web authors in deploying Web-based applications Apply animation techniques
6. Apply the different effects in an image

List of Programs

Perform the following practical exercises GIMP/ Synfig.

1. To change from one shape to another shape

2. To perform rainy effect

3. To subtract one shape from another shape

4. To perform dreamy effect

5. To perform fractal effect

6. To perform transparent glass lettering

7. To bounce a ball

8. To perform smoky effect

9. To perform text portrait

10. To perform bokeh effect

Suggested Readings

1. Bernard 't Hooft · (2018)The Ultimate GIMP 2.10 Guide Learn Professional Photo Editing .

2. Olivier Lecarme, Karine Delvare ·(2017).The Book of GIMP A Complete Guide to Nearly Everything.

3. 2D Animation, Synfig Studio, AMC Collge 2016.

Websites

1. https://www.gimp.org/tutorials/

2. https://www.gimp.org/tutorials/The_Basics/

3. https://www.youtube.com/watch?v=Q8C0LJPpr64

4. https://www.youtube.com/watch?v=2EPIUyFJ4ag

5. https://www.youtube.com/watch?v=5B_Aok26LKc

6. https://www.youtube.com/watch?v=KNU5Yiqh73U

7. https://www.youtube.com/watch?v=zYA4gYho5vo

22ITU414A   **.Net Programming-Practical**

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal: **40** External: **60** Total: **100**
                                                          End Semester Exam: 3 Hours

Course Objectives (CO)
- To Create windows forms using arrays and flow control statements.
- To Learn to use Basic windows controls using Visual Basic.Net
- To Learn to use the classes and namespaces in the .NET Framework class library.
- To Create Multiple Document Interface application..
- To assemble multiple forms, modules, and menus into working VB.NET solutions
- To Compare subroutines, Functions and Events

Course Outcomes (COs)
Upon completion of this course the students will be able to:
1. Develop Windows based applications using Visual Basic.Net
2. Learn various tools in .net applications
3. Implement ADO.Net concept in VB.Net
4. Develop simple application using different controls –Facilitating user interaction.
5. Analyze error prone code.
6. Apply techniques to develop error-free software

List of Programs

1. Develop a program to factorial of a number using function

2. Write a Program to perform various string manipulation functions.

3. Using windows application form, create a form, place controls and manipulate data.

4. Implement simple textpad to perform undo, redo, cut, copy, paste, select all, find, replace, loadfile, savefile operations using richtextbox.

5. Create a form to demonstrate use of methods and properties of listbox.

6. Create form to demonstrate use of methods and properties of Listview.

7. Create MDI application having file menu (New, Open, Save, Print, Close) and Format menu (Font, Forecolor, Backcolor)Write a program to create a screen saver using controls

8. Using windows Application: Design Employee Details, use Sql Server as back end and also use checked list box.

9. Create employee registration form to collect details (using radio button, checkbox and other controls).

10. Implement canteen order form to take order from customer (using listbox and combobox)

Suggested Readings

1. Evangelos Petroutsos (2019) , Mastering Visual Basic.Net, BPB Publications, New Delhi.

2. Ying Bai, Practical Database Programming with Visual Basic.Net (2018). 2nd Edition, John Wiley & Sons Publication, Canada

3. Shirish Chavan. (2017), Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.

4. Thearon Willis, Bryan Newsome (2016),Beginning Visual Basic, Wrox Publication, New Delhi.

5. Steven Roman ,(2016),VB.Net in Nutshell , 2nd Edition., Paul Lomax, Oreilly.

Websites
1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.w3schools.com/ngws/default.asp
4. www.vbtutot.com
5. https://freevideolectures.com/course/3002/dot-net-tutorial
6. https://www.nptelvideos.com/video.php?id=1760&c=21

Semester – IV

22ITU414B   **Android Programming-Practical**   **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)

- To compare the differences between Android and other mobile development environments.
- To learn the Object-oriented features of Kotlin and APIs for Android Development.
- To describe the working of Android applications, life cycle, manifest, and Intents
- To demonstrate the implementation of Form widgets for Android App development.
- To learn the SQLite database connectivity and database operations with android
- To explore Mobile security issues.

Course Outcomes (COs)

Upon completion of this course the students will be able to:

1. Analyze the Architecture and features of Android with another Mobile Operating System.
2. Evaluate the standard of Kotlin language for developing Android Applications
3. Apply knowledge for creating user Interface and develop activity for Android App.
4. Evaluate the user interface architecture of Android for developing Android Apps
5. Understand the implementation of SQLite database operations with Android.
6. Design and implement Database Application and Content providers.

List of Programs

1. Create an Android Application for implementing Button control.

2. Create an android program for implementing progress bar control.

3. Create an Android application for creating login page for checking Login-id and Password

4. Create an Android application for implementing Spinner control in Android Application

5. Create an Android application for implementing context menu.

6. Create an Android Application with list of any three courses in your college and on selecting a particular course HoD of that course should appear at the bottom of the screen.

7. Create an Android application with three option buttons with three color names and when the particular color is selected, the background color of the App should change.

8. Create an Android Application for drawing any image on screen

9. Create an Android application for implementing date picker control.

10. Create an Android application for creating sub menu.

Suggested readings

1. Peter Spath (2019). Learn Kotlin for Android Development, APress Publications

2. James C.Sheusi,(2018). Android application development for Java programmers, Cengage Learning.

Websites

1. http://www.developer.android.com

2. http://developer.android.com/about/versions/index.html

3. http://developer.android.com/training/basics/firstapp/index.html

4. http://developer.android.com/guide/components/activities.html

5. http://developer.android.com/guide/components/fundamentals.html

6. http://developer.android.com/guide/components/intents-filters.html.

7. http://developer.android.com/training/multiscreen/screensizes.html

8. http://developer.android.com/guide/topics/ui/controls.html

9. http://developer.android.com/guide/topics/ui/declaring-layout.html

10. http://developer.android.com/training/basics/data-storage/databases.html

22SSD401   **Soft Skill Development -II**

Semester – IV
2H – 1C

Instruction Hours / week: L: 2 T: 0 P: 0   Marks: Internal: **100**   External: **0**   Total: **100**
                                                          End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand the prime concepts of Employability and Skill Development.
- To augment the knowledge in Analytical and Mathematical Skills
- To develop and nurture the soft skills of the students through individual and group activities
- To vitalize the all-round development of the students by emphasizing on soft skills and Aptitude
- To embellish self-esteemed individuals by mastering inter-personal skills, team management skills and leadership skills
- To steer and bestow right module of training that meets the industry needs and improve their employability accomplishments.

Course Outcomes (COs)
Upon culmination of this course the students will be able to:
1. To promote communication skills as well as optimistic personality traits.
2. Enhance their employability quotient and thrive in the professional space.
3. Understand the progression in grammar and verbal reasoning.
4. To elevate and enrich their personal and professional efficacies.
5. To sketch their goals and also gets to know diversities in the field of their career planning.
6. To pertain learning in different competitive exams/entrance exams for placement/higher studies.

UNIT I- INDUCTIVE AND DEDUCTIVE CALCULATIONS
- Geometry and Mensuration
- Coding and Decoding
- Odd Man Out and Analogy
- Logical Sequence of Words
- Direction

UNIT II-SELECTION AND ARRANGEMENT
- Permutation and Combination
- Probability
- Data Arrangement
- Cube and Dice
- Image Analysing
- Puzzles

UNIT III- UNDERSTANDING AND ANALYSING DATA
- Problems on Ages
- Data Interpretation

- Logarithms
- Syllogism
- Data Sufficiency
- Blood Relation

UNIT IV- BANKING PROBLEMS
- Percentage
- Profit and Loss
- Interest Calculation

UNIT V- ADVANCEMENT TOWARDS GRAMMAR AND BEHAVIOURAL SKILLS
- Statement and Assumption
- Verbal Analogy
- Jumbled Sentence
- Error Spotting
- Sentence Completion
- Sentence Correction
- Implementing and Enhancing Soft Skills

Suggested Readings
1. Aptitude by Er. Rapid Quantitative Deepak Agarwal and Mr. D.P Gupta
2. Numerical Ability and Quantitative Aptitude for Competitive examinations by P.K.Mittal.
3. Quantitative Aptitude - Quantum CAT bySarvesh K Verma
4. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education
5. Soft skills an integrated approach to maximize personality by SANGEETHA SHARMA, GAJENDRA SINGH CHAUHAN, and Wiley Publishing.

	Semester – V
22ITU501 **Computer Networks**	**4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal : **40** External : **60**   Total: **100**

End Semester Exam: 3 Hours

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- To study Session layer design issues, Transport layer services, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

Unit I -Introduction to Data Communication

An Overview – Data Communication – Network – The Internet - Protocols and Standards. Network Models: Layered Task - The OSI Model and Layers – TCP/IP Protocol Suite – Addressing. **Physical Layer:** Analog and Digital Signals – Periodic and Non-Periodic Signals - Transmission Impairments - Performance.

Unit II -(cont..)

Analog to Digital conversion - digital to analog conversion – Transmission Modes;; multiplexing techniques- Frequency Division Multiplexing –Wavelength Division Multiplexing – Time division Multiplexing. Transmission media: Guided Media – Unguided Media. **Switching:** Circuit-switched Networks – Datagram Network – Virtual-Circuit Networks.

Unit III -Data Link Layer

Error detection and error correction - data-link control- framing- flow and error control – protocols –Noisy channels: Simplest Protocol – Stop–and–Wait Protocol; and Noiseless Channels: Stop–and–Wait Protocol ARQ – Go-Back-N Automatic repeat request – Selective Repeat Automatic Repeat Request – Piggybacking.

Unit IV -Multiple Access Protocol

Random Access : Aloha – CSMA – CSMA/CD – CSMA/CA – Controlled Access: Reservation – Polling – Token Passing. **Networks Layer**: IPv6 Address -Delivery-Forwarding- **Unicast routing protocols:** Intra- and Inter domain Routing -Distance Vector Routing-Link state Routing- Path Vector Routing – Multicast Routing.

Unit V -Transport Layer

Process-to-Process Delivery: Connectionless versus Connection-oriented Service – Reliable versus unreliable – User datagram protocol –Transmission control Protocol. Congestion control and Quality of service: Data Traffic – Congestion Control – Techniques to improve QoS.. **Application layer:** Domain Name Space – E-Mail- FTP- WWW- HTTP.

Suggested Readings
1. Forouzan,B. A. (2019). Data Communications and Networking (6thed.).New Delhi: THM.
2. Alberto Leon-Garcia, Indra Widjaja (2017). Communication Network (4th ed). Mc Graw Hill education.
3. Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika (2016). A Level Data Communication & Network Technologies. BPB publication.
4. Tanenbaum, A. S. (2016). Computer Networks **(**7thed.).New Delhi: PHI.

Web Sites
1. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
2. www.w3schools.com/tcpip/default.asp
3. http://www.engppt.com/2009/12/networking-fourozan-ppt-slides.html
4. http://citengg.blogspot.com/p/behrouz-forouzancomputer-networks4th.html
5. http://www.crectirupati.com/sites/default/files/lecture_notes/DCN%20NOTES.pdf
6. https://nptel.ac.in/courses/106105183/
7. http://172.16.25.76/course/view.php?id=1831

Semester – V

22ITU502A **PHP Programming** **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0 **Marks:** Internal : **40** External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To receive and process form submission data.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes (COs)
Upon completion of this course, the students will be able to
1. Write PHP scripts to handle HTML forms.
2. Write regular expressions including modifiers, operators, and metacharacters.
3. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs
6. Get hands on experience on various techniques of web development and will be able to design and develop a complete website.

Unit I -Introduction to PHP

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP -Basic Syntax, PHP variables and constants -Types of data in PHP, Expressions, scopes of a variable (local, global)- PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwise, ternary and MOD operator-PHP operator Precedence and associativity

Unit II -Handling HTML form with PHP

Capturing Form Data-GET and POST form methods-Dealing with multi value fields Redirecting a form after submission -**PHP conditional events and Loops:** PHP IF Else conditional statements (Nested IF and Else) -Switch case, while, For and Do While Loop -Goto, Break, Continue and exit

Unit III -PHP Functions

Function, Need of Function, declaration and calling of a function -PHP Function with arguments, Default Arguments in Function -Function argument with call by value, call by reference -Scope of Function Global and Local

Unit IV -String Manipulation and Regular Expression

Creating and accessing String, Searching & Replacing String -Formatting, joining and splitting String, String Related Library functions-Use and advantage of regular expression over inbuilt function -Use of preg_match(), preg_replace(), preg_split()-functions in regular expression

Unit V -Array

Anatomy of an Array, Creating index based and Associative array, Accessing array-Looping with Index based array, with associative array using each() and foreach()-Some useful Library function .

Suggested Readings

1. David Sklar, Adam Trachtenberg, (2019). PHP Cookbook: Solutions & Examples for PHP.

2. Robin Nixon,(2018). Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.

3. Luke Welling, Laura Thompson,(2017). PHP and MySQL Web Development, (4th ed.), Addition Paperback, Addison-Wesley Professsional.

4. Timothy Boronczyk, Martin E. Psinas, (2016). PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.

5. Steven Holzner, (2016). PHP: The Complete Reference Paperback, McGraw Hill Education (India).

Websites

1. www.php.net/

2. en.wikipedia.org/wiki/PHP

3. www.w3schools.com/PHP/default.asp

4. http://www.nptelvideos.com/php/php_video_tutorials.php

5. http://172.16.25.76/course/view.php?id=1839

Course Objectives (CO)
- To understand how front-end and back-end techniques necessary to build web applications.
- To learn how to make websites interactive,
- To create data-driven web applications.
- To Get familiar with the latest web development technologies
- To Learn all about SQL and NoSQL databases
- To Learn complete web development process

Course Outcomes (COs)
Upon completion of this course the students will be able to :
1. Understand front-end technologies including JavaScript, jQuery library, and other JavaScript-based plugins.
2. Understand how to access and manipulate objects displayed by browsers, as well as client browser properties.
3. Understand how to work with ReactJS
4. Understand how to overview of NodeJS
5. Understand basics of database design and implementation using relational database management systems
6. Understand web servers, database tools, integrated development environments (IDEs), and other technologies currently used in the web industry

Unit I Introduction CSS

Applying CSS to HTML. Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and ,Font Properties, CSS General Topics

Unit II JavaScript

Introduction to JavaScript-Applying JavaScript (internal and external)-Understanding -JS Syntax-Introduction to Document and Window Object-Variables and Operators-Data Types.

Unit III JavaScript

Num Type Conversion-Math and String Manipulation-Objects and Arrays-Date and Time-Conditional Statements-Switch Case-Looping in JS-Functions

Unit IV - ReactJS

Introduction-Templating using JSX-Components, State and Props-Lifecycle of Components-Rendering List and Portals-Error Handling-Routers-Redux and Redux Saga-Immutable.js-Service Side Rendering-Unit Testing-Webpack

Unit V - NodeJS

Node JS Overview-Node JS - Basics and Setup-Node JS Console-Node JS Command Utilities-Node JS Modules-Node JS Concepts-Node JS Events-Node JS with Express JS-Node JS Database Access

Suggested Readings

1. Jon Duckett (2020), HTML & CSS: Design and Build Websites + JavaScript & Query: Interactive Front-End Web Development

2. Greg Lim, (2020), Beginning Node.js, Express & MongoDB Development Paperback.

3. Ethan Brown (2019), Web Development with Node and Express: Leveraging the JavaScript Stack

4. Anthony Accomazzo, Ari Lerner, and Nate Murray, (2018) Fullstack React: The Complete Guide to ReactJS and Friends,

Websites
1. https://www.w3schools.com/css/
2. https://www.w3schools.com/js/default.asp
3. https://www.w3schools.com/nodejs
4. https://nareshit.in/full-stack-web-development-course/
5. https://catalogue.rrc.ca/Programs/WPG/Parttime/FUSTP-CT/CoursesandDescriptions

Semester – V

22ITU503A   **R Programming**   **4H – 4C**

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal: **40**   External: **60**   Total: **100**
End Semester Exam: **3** Hours

Course Objectives (CO)
- To provide an overview of a new language R used for data science.
- To introduce students to the R programming environment and related eco-system and thus provide them with an in-demand skill-set, in both the research and business environments
- To introduce the extended R ecosystem of libraries and packages
- To demonstrate usage of as standard Programming Language.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
- To enable students to use R to conduct analytics on large real-life datasets.

Course Outcomes (COs)
After the completion of this course, a successful student will be able to:
1. Install and use R for simple programming tasks.

2. Extend the functionality of R by using add-on packages

3. Extract data from files and other sources and perform various data manipulation tasks on them.

4. Code statistical functions in R.

5. Use R Graphics and Tables to visualize results of various statistical operations on data.

6. Apply the knowledge of R gained to data Analytics for real life applications.

Unit I: Introduction

History and Overview of R, Getting Started with R, Getting Help, Data Types, R Nuts and Bolts, **Getting Data In and out of R**: Reading and Writing Data, **Subsetting R objects:** Vector, Matrix, List and Data frames.

Unit II: R Functionalities

Operators in R, Vectorized Operations, **Date and Times in R:** Operations on date and times, **Managing Data frames with the dplyr package:** Data Frames, The dplyr package, dplyr Grammar, select( ),arrange( ), filter( ), rename( ), mutate( ),group_by( ),%>%.

Unit III: Control Structures

if_else, else_if, for loops, Nested for loop, while, repeat, next, break-Scoping Rules-**Functions in R:** lapply, tapply, split, mapply, apply-Combining Variables with the c, cbind, rbind Functions-Coding Standards in R-String Operations.

Unit IV: Statistical Analysis IN R

Statistical Analysis in R: Data types – Categorical – Binary – ordinal – Nominal – Continuous – Discrete – Data Dimensions – Univariate – bivariate – multivariate – Numerical Measures – Central Tendency – Mean – Median – Mode.R Packages-Debugging Tools-Simulation-R Profiler-Statistical Functions – Comparison of Samples – same groups – different groups – Independent groups - Student T Test – Dependent Test – Independent Test.

Unit V: Import and Export Data into R

Read CSV, Excel, SPSS, Stata, SAS Files. **Data visualization**: Base graphics system in R, Advanced R graphics: ggplot - **Reporting** – Data Preparation – Embedding R chunks – Labelling and reusing code chunks – Report Compiling – Configuring – R Packages – shiny - ggvis

Suggested Readings

1. Norman Matloff, (2011) The Art of R Programming - A Tour of Statistical Software Design, No Starch Press.
2. William N. Venables and David M. Smith, (2009) An Introduction to R. 2nd Edition. Network Theory Limited.

Websites

1. https://www.w3schools.in/r

2. https://www.analyticsvidhya.com/blog/2016/02/complete-tutorial-learn-data-science-scratch/

3. https://www.statmethods.net/r-tutorial

4. https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf

5. https://www.tutorialkart.com/r-tutorial

22ITU503B   **Programming in MATLAB**   4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal: **40**   External: **60**   Total: **100**
End Semester Exam: **3** Hours

Course Objectives (CO)
- To Understand the MATLAB environment
- To do simple calculations using MATLAB
- To carry out simple numerical computations and analyses using MATLAB
- To write simple functions and programs that manipulate text files and tables of strings.
- To re-use a number of simple programming templates for some common programming tasks
- To understand the elements and practicalities of computer programming through the MATLAB mathematical computing environment

Course Outcomes (COs)
Upon successful completion of this course, the student should be able to:
1. Understand the main features of the MATLAB development environment
2. Use the MATLAB GUI effectively
3. Design simple algorithms to solve problems
4. Write simple programs in MATLAB to solve scientific and mathematical problems
5. Apply basic regression and classification algorithms.
6. Have the basic understanding on how to explore Statistics and Machine Learning Toolbox advanced methods (i.e. feature selection, regularization and other dimensionality methods).

Unit I -MATLAB Environment
Brief Introduction-Installation of MATLAB – History-Use of MATLAB- Key features-MATLAB window-Command window – Workspace-Basic commands- Defining Variables - Assigning variables - Operations with variables – functions – Matrices and Vectors –Strings – Input and Output statements -Script files – Arrays in Matlab – Addressing Arrays – Dynamic Array – Cell Array – Structure Array-

Unit II- Programming in MATLAB
Relational and logical operators – Control statements IF-END, IF-ELSE – END, ELSEIF, SWITCH CASE – FOR loop – While loop. Data files and Data types - Character and string-Arrays and vectors. Arithmetic operations-Logical operators-Solving arithmetic equations-Matrix operations-M files Working with script tools - Writing Script file - Executing script files - The MATLAB Editor - Saving m files

Unit III -Plotting and Functions in MATLAB
Functions - Writing user defined functions- Built in Function, calling- Return Value - Types of Functions- Global Variables. Basic Graph Plots: Basic plotting, 2D plots – modifying line styles – markers and colors – grids – placing text on a plot –Built in functions, User defined functions, generating waveforms, Sound replay, load and save.

Unit IV – Advanced Methods and File I/O
Probability and Statistics, Data Structures, Images and Animation. File input and output – Opening & Closing – Writing & Reading data from files. Importing Data, Reading and Writing Excel Files

Unit V -Image Processing with MATLAB
Introduction - Working with Images in MATLAB–MATLAB Commands for Image Enhancement Techniques - Filtering Images - Image Restoration Techniques - Feature Extraction Using Segmentation and Edge Detection - Image Registration and Image Reconstruction

Suggested Readings
1. Stormy Attaway ,(2018),MATLAB: A Practical Introduction to Programming and Problem Solving, 5th edition, Elsevier.

2. Gonzalez, R.E. Woods, and S.L. Eddins.(2016) Digital Image Processing using Matlab, Prentice Hall.

3. Holly Moore,(2015), "MATLAB for Engineers" Third Edition – Pearson Publications

4. Stephen J. Chapman,(2012),"MATLAB Programming for Engineers" Fourth Edition.

Websites
1. https://in.mathworks.com/learn-matlab/matlab-tutorial
2. https://www.tutorialspoint.com/matlab/index.htm
3. https://www.javatpoint.com/matlab

	Semester – V
22ITU504A **Data Mining**	**3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0   Marks: Internal : **40**   External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To be familiar with mathematical foundations of data mining tools.
- To understand and implement classical models and algorithms in data warehouses and data mining
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To master data mining techniques in various applications like social, scientific and environmental context.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems
- To develop research interest towards advances in data mining

Course Outcomes (COs)
After the completion of this course, a successful student will be able to:
1. Introduce students to the basic concepts and techniques of Data Mining.
2. Develop skills of using recent data mining software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Possess some knowledge of the concepts and terminology associated with database systems, statistics, and machine learning
5. Identify appropriate data mining algorithms to solve real world problems
6. Benefit the user experiences towards research and innovation. integration

UNIT I- Introduction

Data mining application - data mining techniques - the future of data mining - data mining software - Association rules mining: basics- task and a naïve algorithm- Apriori algorithm - improve the efficient of the Apriori algorithm - mining frequent pattern without candidate generation (FP-growth) - performance evaluation of algorithms.

UNIT II - Classification

Introduction - decision tree - over fitting and pruning - DT rules- Naive bayes method- estimation predictive accuracy of classification methods - other evaluation criteria for classification method - classification software.

UNIT III - Cluster analysis

cluster analysis - types of data - computing distances-types of cluster analysis methods - partitioned methods - hierarchical methods - density based methods - dealing with large databases - quality and validity of cluster analysis methods - cluster analysis software.

UNIT IV- Web data mining

Introduction- web terminology and characteristics- locality and hierarchy in the web- web content mining-web usage mining- web structure mining - web mining software - Search engines: Search engines functionality- search engines architecture - ranking of web pages.

UNIT V -Data warehousing

Introduction - Operational data sources- data warehousing - Data warehousing design - Guidelines for data warehousing implementation - Data warehousing metadata - Online analytical processing (OLAP): Introduction - OLAP characteristics of OLAP system - Multidimensional view and data cube - Data cube implementation - Data cube operations OLAP implementation guidelines.

Suggested Readings

1. Steinbach Tan, Kumar,(2018) "Introduction to Data Mining", First edition, Pearson Education.
2. Mohammed J. Zaki, Wagner Meira, Jr.(2017) "Data Mining and Analysis Fundamental Concepts and Algorithms", Cambridge University Press.
3. Han, Kamber& Pei,(2017) "Data Mining: Concepts and Techniques", Morgan Kaufmann Publisher, Third Edition.
4. G.K. Gupta,(2016), "Introduction to Data mining with case studies", 2nd Edition, PHI Private limited, New Delhi.

Websites

1. www.geeksforgeeks.org
2. www.tutorialride.com
3. www.javatpoint.com
4. https://nptel.ac.in/courses/106105174/
5. http://172.16.25.76/course/view.php?id=100

Semester – V

22ITU504B   **Machine Learning**   3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0   Marks: Internal: **40**   External: **60**   Total: **100**
                                                               End Semester Exam: 3 Hours

Course Objectives (CO)

- To develop an appreciation for what is involved in learning from data.

- To understand a wide variety of learning algorithms.

- To understand how to perform evaluation of learning algorithms and model selection.

- To introduce students to the basic concepts and techniques of Machine Learning.

- To become familiar with regression methods, classification methods, clustering methods.

- To become familiar with Dimensionality reduction Techniques.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Have a broad understanding of machine learning algorithms and their use in data-driven knowledge discovery and program synthesis.

2. Design and implement several machine learning algorithms in Java.

3. Identify, formulate and solve machine learning problems that arise in practical applications.

4. Have knowledge of the strengths and weaknesses of different machine learning algorithms (relative to the characteristics of the application domain) and be able to adapt or combine some of the key elements of existing machine learning algorithms to design new algorithms as needed.

5. Identify machine learning techniques suitable for a given problem

6. Solve the problems using various machine learning techniques

Unit I - Foundations of Learning

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound –bias and variance – learning curve

Unit II - Linear Models

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural

networks structures – support vector machines – soft margin SVM – generalization and over fitting – regularization – validation

Unit III - Distance-Based Models

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k- d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta silhouttes – hierarchical clustering – k- d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

Unit IV - Tree and Rule Models

 Decision trees – learning decision trees – ranking and probability estimation trees –Regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first -order rule learning

Unit V - Reinforcement Learning

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal - difference learning – active reinforcement learning – genetic algorithm for Reinforcement Learning - exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

Suggested Readings

1. Tom.M.Mitchell (2019), Machine Learning, Tata McGraw Hill Publications
2. Y. S. Abu - Mostafa, M. Magdon-Ismail, and H.-T. Lin. (2018).Learning from Data, AMLBook Publishers.
3. P. Flach. (2017). "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press.
4. K. P. Murphy. (2017). Machine Learning: A probabilistic perspective, MIT Press,
5. D. Barber. (2015). Bayesian Reasoning and Machine Learning, Cambridge University Press.

Web Sites

1. https://machinelearningmastery.com/linear-regression-for-machine-learning/
2. https://www.cambridge.org/core/books/machine-learning/distancebased-models/
3. https://dzone.com/articles/machine-learning-with-decision-trees
4. http://reinforcementlearning.ai-depot.com/
5. https://nptel.ac.in/courses/106106139/
6. https://swayam.gov.in/nd1_noc19_cs81/preview

Semester – V

22ITU511	**Computer Networks-Practical**	**3H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal : **40**   External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- To study Session layer design issues, Transport layer services, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To study data link layer concepts, design issues, and protocols.
- To read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes (COs)
1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications

List of Programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.

2. Simulate and implement stop and wait protocol for noisy channel.

3. Simulate and implement go back n sliding window protocol.

4. Simulate and implement selective repeat sliding window protocol.

5. Simulate and implement distance vector routing algorithm

6. Simulate and implement Dijkstra algorithm for shortest path routing.

Suggested Readings

1. Forouzan,B. A. (2017). Data Communications and Networking (5[th]ed.).New Delhi: THM.
2. Alberto Leon-Garcia, Indra Widjaja (2017). Communication Network (2nd ed). Mc Graw Hill education.
3. Tanenbaum, A. S. (2012). Computer Networks (5thed.).New Delhi: PHI.

4. Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika (2010). A Level Data Communication & Network Technologies. BPB publication.
5. Wayne Tomasi (2007) Introduction to Data Communications and Networking (1st ed). Pearson

Web Sites
1. https://forgetcode.com/c/1203-crc-generation-in-computer-networks
2. https://gist.github.com/ankurdinge/1202643
3. https://www.geeksforgeeks.org/
4. https://www.thelearningpoint.net/computer-science/c-program
5. www.w3schools.com/tcpip/default.asp
6. http://172.16.25.76/course/view.php?id=1835

Semester – V

22ITU512A   **PHP Programming-Practical**   **3H – 1C**

Instruction Hours / week: L:0 T: 0 P: 3   **Marks:** Internal : **40**   External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)
- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To receive and process form submission data.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes (COs)
Upon completion of this course, the students will be able to
1. Write PHP scripts to handle HTML forms.
2. Write regular expressions including modifiers, operators, and metacharacters.
3. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs
6. Get hands on experience on various techniques of web development and will be able to design and develop a complete website.

List of Programs

1. Create a PHP page using functions for comparing three integers and print the largest number.

2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.

3. WAP to check whether the given number is prime or not.

4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.

5. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)

6. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

7. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.

8. Create a script to construct the following pattern, using nested for loop.

```
*
* *
* * *
* * * *
* * * * *
```

9. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.

10.Write a simple PHP program to demonstrate use of various built-instring functions.

11.Write a simple PHP program to demonstrate use of simple function and parameterized function.

12.Write the PHP programs to Multiply two matrices.

13.Write a PHP program to display a digital clock which displays the current time of the server.

14. Develop web page with data validation.

Suggested Readings

1. David Sklar, Adam Trachtenberg, (2019). PHP Cookbook: Solutions & Examples for PHP.

2. Robin Nixon,(2018). Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.

3. Luke Welling, Laura Thompson,(2017). PHP and MySQL Web Development, (4th ed.), Addition Paperback, Addison-Wesley Professsional.

4. Timothy Boronczyk, Martin E. Psinas, (2016). PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.

5. Steven Holzner, (2016). PHP: The Complete Reference Paperback, McGraw Hill Education (India).

Semester – V

22ITU512B   **Full Stack Web Development-Practical**   **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P:3   **Marks:** Internal : **40**   External : **60** Total: **100**
                                                      End Semester Exam: 3 Hours

Course Objectives (CO)
- To understand how front-end and back-end techniques necessary to build web applications.
- To learn how to make websites interactive,
- To create data-driven web applications.
- To Get familiar with the latest web development technologies
- To Learn all about SQL and NoSQL databases
- To Learn complete web development process

Course Outcomes (COs)
Upon completion of this course the students will be able to :
1. Understand front-end technologies including JavaScript, jQuery library, and other JavaScript-based plugins.
2. Understand how to access and manipulate objects displayed by browsers, as well as client browser properties.
3. Understand how to work with ReactJS
4. Understand how to overview of NodeJS
5. Understand basics of database design and implementation using relational database management systems
6. Understand web servers, database tools, integrated development environments (IDEs), and other technologies currently used in the web industry

List of Programs

1. Applying CSS class animates to zoom an image from 0 to 100% in size
2. Applying CSS animation where class spins an element 360 degrees
3. Create style sheets with the style elements.
4. Changing image using mouseover event
5. Create calculator format using java script.
6. Create an array of 10 numbers and sort them using javascript
7. Design and apply your application form for course enrolment using Javascript.
8. Making an Interactive Component using ReactJS
9. Implementing Time Travel in ReactJS
10. Create a event-driven applications using Node.js
11. Write a program to demonstrate EventEmitter Object in Node.js
12. Write a Node.js module that returns a date and time object

Suggested Readings

1. Jon Duckett (2020), HTML & CSS: Design and Build Websites + JavaScript & Query: Interactive Front-End Web Development

2. Greg Lim, (2020), Beginning Node.js, Express & MongoDB Development Paperback.

3. Ethan Brown (2019), Web Development with Node and Express: Leveraging the JavaScript Stack

4. Anthony Accomazzo, Ari Lerner, and Nate Murray, (2018) Fullstack React: The Complete Guide to ReactJS and Friends,

Websites
1. https://www.w3schools.com/css/

2. https://www.w3schools.com/js/default.asp

3. https://www.w3schools.com/nodejs

4. https://nareshit.in/full-stack-web-development-course/

5. https://catalogue.rrc.ca/Programs/WPG/Parttime/FUSTP-CT/CoursesandDescriptions

22ITU513A   **R Programming-Practical**

Semester – V
3H – 1C

Instruction Hours / week: L: 0 T: 0 P:3   **Marks:** Internal : **40**   External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To provide an overview of a new language R used for data science.
- To introduce students to the R programming environment and related eco-system and thus provide them with an in-demand skill-set, in both the research and business environments
- To introduce the extended R ecosystem of libraries and packages
- To demonstrate usage of as standard Programming Language.
- To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
- To enable students to use R to conduct analytics on large real life datasets.

Course Outcomes (COs)

After the completion of this course, a successful student will be able to:

1. Install and use R for simple programming tasks.

2. Extend the functionality of R by using add-on packages

3. Extract data from files and other sources and perform various data manipulation tasks on them.

4. Code statistical functions in R.

5. Use R Graphics and Tables to visualize results of various statistical operations on data.

6. Apply the knowledge of R gained to data Analytics for real life applications.

Software Lab Based on R Programming

1. Write a program that prints _Hello World' to the screen.
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n
3. Write a program that prints a multiplication table for numbers up to 12.
4. Write a function that returns the largest element in a list.
5. Write a function that computes the running total of a list.
6. Write a function that tests whether a string is a palindrome.
7. Implement the following sorting algorithms: Selection sort, Insertion sort, Bubble Sort
8. Implement linear search.
9. Implement binary search.
10. Implement matrices addition, subtraction and Multiplication

Suggested Readings

1. Norman Matloff.(2017) The Art of R Programming - A Tour of Statistical Software Design, No Starch Press.

2. William N. Venables and David M. Smith.(2016) An Introduction to R. 4th Edition.Network Theory Limited.

Websites

1. https://www.w3schools.in/r

2. https://www.analyticsvidhya.com/blog/2016/02/complete-tutorial-learn-data-science-scratch/

3. https://www.statmethods.net/r-tutorial

4. https://www.cs.upc.edu/~robert/teaching/estadistica/rprogramming.pdf

5. https://www.tutorialkart.com/r-tutorial

Semester – V

22ITU513B   **Programming in MATLAB -Practical**   **3H – 1C**

Instruction Hours / week: L: 0 T: 0 P: 3   **Marks:** Internal : **40**   External : **60** Total: **100**
                                                        End Semester Exam : 3 Hours

Course Objectives (CO)
- To Understand the MATLAB environment
- To do simple calculations using MATLAB
- To carry out simple numerical computations and analyses using MATLAB
- To write simple functions and programs that manipulate text files and tables of strings.
- To re-use a number of simple programming templates for some common programming tasks
- To understand the elements and practicalities of computer programming through the MATLAB mathematical computing environment

Course Outcomes (COs)
Upon successful completion of this course, the student should be able to:
1. Understand the main features of the MATLAB development environment
2. Use the MATLAB GUI effectively
3. Design simple algorithms to solve problems
4. Write simple programs in MATLAB to solve scientific and mathematical problems
5. Apply basic regression and classification algorithms.
6. Have the basic understanding on how to explore Statistics and Machine Learning Toolbox advanced methods (i.e. feature selection, regularization and other dimensionality methods).

List of Programs
1. Write a program to assign the following expressions to a variable A and then to print out the value of A.
   a. (3+4)/(5+6)
   b. $2\Pi^2$
   c. $\sqrt{2}$
   d. $(0.0000123 + 5.67 \times 10\text{-}3) \times 0.4567 \times 10\text{-}4$

2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5, and adding 32. Assign a variable called C the value 37, and implement this formula to assign a variable F the Fahrenheit equivalent of 37 Celsius.

3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5. Using N, create assignment statements for a vector X which will result in X having these values:
   a. 2, 4, 6, 8, 10
   b. 1/2, 1, 3/2, 2, 5/2
   c. 1, 1/2, 1/3, 1/4, 1/5
   d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (in pounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. Use MATLAB to calculate the total bill.

5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use this function to sort a list of names into alphabetical order.

6. The ─identity‖ matrix is a square matrix that has ones on the diagonal and zeros elsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB to find a matrix B, such that when multiplied by matrix A=[1 2; -1 0] the identity matrix I=[1 0; 0 1] is generated. That is A*B=I.

7. Create an array of N numbers. Now find a single MATLAB statement that picks out from that array the 1,4,9,16,…,$\sqrt{N}$th entries, i.e. those numbers which have indices that are square numbers.

8. Draw a graph that joins the points (0,1), (4,3), (2,0) and (5,-2).

9. The seeds on a sunflower are distributed according to the formula below. Plot a small circle at each of the first 1000 co-ordinates :

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180}\pi n$$

10. Calculate 10 approximate points from the function y=2x by using the formulae:
    i. xn = n
    ii. yn = 2n + rand - 0.5
Fit a line of best fit to these points using the function polyfit() with degree=1, and generate co-ordinates from the line of best fit using polyval(). Use the on-line help to find out how to use these functions. Plot the raw data and the line of best fit.

11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz. Save the sound to a file called ex35.wav. Plot the first 100 samples.

12. Calculate and replay a 2 second chirp. That is, a sinusoid that steadily increases in frequency with time, from say 250Hz at the start to 1000Hz at the end.

13. Build a square wave by adding together 10 odd harmonics: 1f, 3f, 5f, etc. The amplitude of the nth harmonic should be 1/n. Display a graph of one cycle of the result superimposed on the individual harmonics.

14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius. Make sure the program has a title comment and a help page. Test from the command window with:

    i. FtoC(96)
    ii. lookfor Fahrenheit
    iii. help FtoC

15. Write a program to input 2 strings from the user and to print out (i) the concatenation of the two strings with a space between them, (ii) a line of asterisks the same length as the concatenated strings, and (iii) the reversed concatenation. For example:

i. Enter string 1: Mark
ii. Enter string 2: Huckvale
iii. Mark Huckvale
iv. *************
v. elavkcuH kraM

Suggested Readings

1. Stormy Attaway ,(2018),MATLAB: A Practical Introduction to Programming and Problem Solving, 5th edition, Elsevier.

2. Gonzalez, R.E. Woods, and S.L. Eddins.(2016) Digital Image Processing using Matlab, Prentice Hall.

3. Holly Moore,(2015), "MATLAB for Engineers" Third Edition – Pearson Publications

4. Stephen J. Chapman,(2012),"MATLAB Programming for Engineers" Fourth Edition.

Websites

1. https://in.mathworks.com/learn-matlab/matlab-tutorial
2. https://www.tutorialspoint.com/matlab/index.htm
3. https://www.javatpoint.com/matlab

22ITU514A   **Data Mining-Practical**

Instruction Hours / week: L:0 T: 0 P: 3   Marks: Internal : **40**   External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To be familiar with mathematical foundations of data mining tools.
- To understand and implement classical models and algorithms in data warehouses and data mining
- To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To master data mining techniques in various applications like social, scientific and environmental context.
- To develop skill in selecting the appropriate data mining algorithm for solving practical problems
- To develop research interest towards advances in data mining

Course Outcomes (COs)
After the completion of this course, a successful student will be able to:
1. Introduce students to the basic concepts and techniques of Data Mining.
2. Develop skills of using recent data mining software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Possess some knowledge of the concepts and terminology associated with database systems, statistics, and machine learning
5. Identify appropriate data mining algorithms to solve real world problems
6. Benefit the user experiences towards research and innovation. integration

List of Programs
1. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). for test options, first choose "Use training set", then choose "Percentage split" using default 66% percentage split. Report model percent error rate.
2. Use iris dataset preprocess and classify it with j4.8 and Naive Bayes classifier. Examine the tree in the classifier output panel.
3. Using the dataset ReutersCorn – Train and ReutersGrain – Train. Classify articles using binary attributes and word count attributes.
4. Apply any two association rule based algorithm for the supermarket analysis.
5. Using weka experimenter perform comparison analysis of j4.8, oneR and ID3 forvote dataset.
6. Using weka experimenter perform comparison analysis of Naive Bayes with different datasets.
7. Apply ZeroR, OneR and j4.8, to classify the iris data in an experiment using 10 train and test runs, with 66% of the data used for 34% used for testing.

8. Using Weka Knowledge flow set up a flow to load an ARFF file (batch mode) and perform a cross-validation using j4.8 (WEKS's C4.5implementation).
9. Draw multiple ROC curves in the same plot window, using j4.8 and RandomForest as classifiers.
10. Use any three clustering algorithm on Vehicle data set and find best among them.

Suggested Readings
1. Steinbach Tan, Kumar,(2018) "Introduction to Data Mining", First edition, Pearson Education.
2. Mohammed J. Zaki, Wagner Meira, Jr.(2017) "Data Mining and Analysis Fundamental Concepts and Algorithms", Cambridge University Press.
3. Han, Kamber& Pei,(2017) "Data Mining: Concepts and Techniques", Morgan Kaufmann Publisher, Third Edition.
4. G.K. Gupta,(2016), "Introduction to Data mining with case studies", 2nd Edition, PHI Private limited, New Delhi.

Websites
1. www.geeksforgeeks.org
2. www.tutorialride.com
3. www.javatpoint.com

Semester – V

22ITU514B   **Machine Learning-Practical**   **3H – 1C**

Instruction Hours / week: L:0 T: 0 P: 3   **Marks:** Internal : **40**   External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To develop an appreciation for what is involved in learning from data.

- To understand a wide variety of learning algorithms.

- To understand how to perform evaluation of learning algorithms and model selection.

- To introduce students to the basic concepts and techniques of Machine Learning.

- To become familiar with regression methods, classification methods, clustering methods.

- To become familiar with Dimensionality reduction Techniques.

Course Outcomes (COs)
After the completion of this course, a successful student will be able to:
1. Have a broad understanding of machine learning algorithms and their use in data-driven knowledge discovery and program synthesis.
2. Design and implement several machine learning algorithms in Java.
3. Identify, formulate and solve machine learning problems that arise in practical applications.
4. Have knowledge of the strengths and weaknesses of different machine learning algorithms (relative to the characteristics of the application domain) and be able to adapt or combine some of the key elements of existing machine learning algorithms to design new algorithms as needed.
5. Identify machine learning techniques suitable for a given problem
6. Solve the problems using various machine learning techniques

List of Programs

1. Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.
2. Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).
3. Create, initialize and display simple variables and simple strings and use simple formatting for variable.

4. Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.
5. Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current Course Objectives.
6. Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.
7. Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, additing/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.
8. Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.
9. Generate different subplots from a given plot and color plot data.
10. Use conditional statements and different type of loops based on simple example/s.
11. Perform vectorized implementation of simple matrix operation like finding the transpose of a matrix, adding, subtracting or multiplying two matrices.
12. Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.
13. Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.
14. Implement a classification/ logistic regression problem. For example based on different features of students data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.
15. Use some function for regularization of dataset based on problem 14.
16. Use some function for neural networks, like Stochastic Gradient Descent or back propagation - algorithm to predict the value of a variable based on the dataset of problem

Suggested Readings

1.   Tom.M.Mitchell (2019), Machine Learning, Tata McGraw Hill Publications
2. Y. S. Abu - Mostafa, M. Magdon-Ismail, and H.-T. Lin. (2018).Learning from Data, AMLBook Publishers.
3. P. Flach. (2017). "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press.
4. K. P. Murphy. (2017). Machine Learning: A probabilistic perspective, MIT Press,
5. D. Barber. (2015). Bayesian Reasoning and Machine Learning, Cambridge University Press.

22ITUOE501   **Open Elective – Multimedia and its Applications**

Instruction Hours / week: L: 3 T: 0 P: 0   **Marks:** Internal : **40**   External : **60** Total: **100**
                                                                                    End Semester Exam : 3 Hours

Course Objectives (CO)
- To understand the multimedia communications systems, application and basic principles,
- To analyze of the multimedia streaming,
- To perform and establish multimedia communication terminals,
- To present multimedia communications
- Explore a brief history of multimedia in education
- Analyze instructional and informational media (print materials, audio/visual materials and/or web-based materials, games/simulations, etc.)

Course Outcomes (COs)
Upon successful completion the student will be able to:
1. Define multimedia to potential clients.
2. Identify and describe the function of the general skill sets in the multimedia industry.
3. Identify the basic components of a multimedia project.
4. Identify the basic hardware and software requirements for multimedia development and playback.
5. Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video).
6. Use appropriate tools for the design, development and creation of digital media artefacts.

Unit I
Multimedia – An overview: Introduction – Multimedia presentation and production – Characteristics of Multimedia presentation – Hardware and Software requirements – Uses of Multimedia. Text: Types of text – Font- Text file formats. Image: Image data representation – Image file formats – image processing software. Graphics: Advantages of graphics – Uses – Component of a graphics system.

Unit II
Audio: Sound waves – types and properties of sound – components of audio system – Digital audio – Musical Instrument Digital Interface (MIDI) – Audio file formats – Audio processing software. Video: Motion video – Television systems – Video file formats – video processing software. Animation: Uses of animation – computer based animation -Animation file formats – Animation software.

Unit III
Introducing photoshop elements: About elements – welcome screen – create mode – menu bar – toolbox – options bar – panels. Organizing images: Obtaining images -tagging images – searching for images – opening and saving images. Selecting areas – Layers – Text and drawing tools.

Unit IV
Understanding flash: Understanding flash basic elements – creating a simple animation. Learning Flash toolbox: Learning the toolbox – using tools. Learning flash panels: Understanding the panels. Using timeline and layers: Understanding how timeline works – Understanding layers. Drawing objects: Drawing lines and fills – using colors – Rotating, skewing and scaling – grouping objects. Creating animation – How animation works – creating motion tweens – creating shape tweens. Understanding masks – creating masks.

Unit V
Creating symbols and using the library: Learning about symbols – creating symbols – using libraries. Learning Basic Actionscript concepts: Actionscript basics – data type basics. Learning basic actionscript programming: Applying Actionscript – Using Actionscript to control actions – Using Actionscript to control properties – Understanding Actions and Event Handlers.

Suggested Readings

1. Ranjan Parekh (2018). Principles of Multimedia (5th ed.). TataMcGraw Hill.
2. Nick Vandome (2016). Photoshop Elements 9. TataMcGraw Hill.
3. Brian Underdahl (2017). Macromedia Flash MX – A Beginners Guide. Dreamtech Press.
4. Tay Vaughan (2015). Fundamentals of Multimedia (7 th ed.). TataMcGraw Hill.
5. Bill Sanders (2014). Flash 5 Actionscript (1st ed.). New Delhi DreamTech Press.

Websites
1. en.wikipedia.org/wiki/Multimedia
2. www.arena-multimedia.com/
3. www.nextwavemultimedia.com/

Semester – V

22ITU591   **Internship**   **0H – 2C**

Instruction Hours / week: L: 0 T: 0 P: 0   **Marks:** Internal : **40**   External : **60** Total: **100**
                                        End Semester Exam : 3 Hours

22ITU601   **Artificial Intelligence**

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal : **40** External : **60** Total: **100**
                                                                    End Semester Exam : 3 Hours

Course Objectives (CO)
- To understand the various characteristics of Intelligent agents
- To learn about the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.
- Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.

Course Outcomes (COs)
At the end of the course, the student should be able to:
1. Identify problems that are amenable to solution by AI methods.
2. Identify appropriate AI methods to solve a given problem.
3. Formalize a given problem in the language/framework of different AI methods.
4. Implement basic AI algorithms.
5. Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.
6. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

Unit I - Introduction to AI and production systems

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem solving methods – Problem graphs, Matching. Heuristic functions - Hill Climbing-Depth first and Breath first search, A* Algorithm, Simulated Annealing, Constraints satisfaction.

Unit II - Representation of Knowledge

Game playing –Predicate logic – Representing Instance and Isa Relationship, Introduction to predicate calculus, Resolution, Knowledge representation -Production based system, Frame based system

Unit III - Knowledge Inference & Planning

Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning – Certainty factors -Basic plan generation systems – Strips -Advanced plan generation systems – K strips.

Unit IV- Machine Learning and Expert Systems

Learning- Machine learning, Adaptive Learning.Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition – Meta knowledge. Typical expert systems–MYCIN, DART, XOON, Expert systems shells.

Unit V – Prolog

Programming in Logic (PROLOG): Introduction, Prolog variables, Syntax, Using rules, Input and Output predicates, Procedural and declarative meanings, Arithmetic operation, unification, lists, control structures, use of fail, CUT, Not.

Suggested Readings

1. Kevin Knight and Elaine Rich, Nair B.(2018), "Artificial Intelligence (SIE)", Mc Graw Hill.
2. Dan W. Patterson,(2017) "Introduction to AI and ES", Pearson Education.
3. Ivan Brako,PROLOG (2017): Programming for Artificial Intelligence,3rd edition Pearson.
4. Peter Jackson (2016), "Introduction to Expert Systems", 3rd Edition, Pearson Education.
5. Stuart Russel and Peter Norvig,(2016) "AI – A Modern Approach", 2nd Edition, Pearson Education.
6. Deepak Khemani,(2015) "Artificial Intelligence", Tata Mc Graw Hill Education.

Websites

1. https://www.tutorialspoint.com/artificial_intelligence/index.htm
2. https://nptel.ac.in/courses/106/105/106105077/

22ITU602A   **System Programming**

Semester – VI
4H – 4C

Instruction Hours / week: L: 4 T: 0 P: 0   **Marks:** Internal : **40**   External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the role and functioning of various system programs over application program.
- To understand the need to follow the syntax in writing an application program and to learn the how the analysis phase of compiler is designed to understand the programmer's requirements without ambiguity.
- To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time.

Course Outcomes (COs)
Upon completion of the subject, students will be able to
1. Organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer
2. Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software)
3. Apply the knowledge and techniques learnt to develop solutions to realworld problems
4. Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools
5. Organize and manage software built for deployment and demonstration
6. Analyze requirements and solve problems using systematic planning and development approaches

Unit I
Assemblers & Loaders, Linkers: One pass and two pass assembler design of an assembler, Absolute loader, relocation and linking concepts, relocating loader and Dynamic Linking., overview of compilation, Phases of a compiler.

Unit II

Lexical Analysis:

Role of a Lexical analyzer, Specification and recognition of tokens, Symbol table, lexical

Unit III

Parsing:

Bottom up parsing- LR parser, yaITU. **Intermediate representations: Three** address code generation, syntax directed translation, translation of types, control Statements.

Unit IV

Storage organization: Activation records stack allocation.

Unit V

Code Generation: Object code generation

Suggested Readings
1. Santanu Chattopadhyaya. (2018). Systems Programming. New Delhi: PHI.
2. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2016). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.
3. Dhamdhere, D. M. (2016). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2015). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2015). Modern Compiler Design (2nd ed.). Springer.

Websites
1. https://www.tutorialspoint.com
2. https://www.udemy.com/topic/system-programming/
3. http://www.compsci.hunter.cuny.edu/

22ITU602B   **Compiler Design**

Instruction Hours / week: L: 4 T: 0 P: 0   Marks: Internal : **40**   External : **60** Total: **100**
End Semester Exam : 3 Hours

Course Objectives (CO)
- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand syntax-directed translation and intermediate code generation
- To learn to implement run-time storage administration.
- To learn to implement code optimization and code generator.
- To explore the principles, algorithms, and data structures involved in the design and construction of compilers.

Course Outcomes (COs)
Upon completion of this course, the students will be able to
1. Understand the different phases of compiler.
2. Apply different parsing algorithms to develop the parsers for a given grammar.
3. Understand syntax-directed translation and run-time environment.
4. Develop the run- time storage administration.
5. Understand to implement code optimization techniques and a simple code generator.
6. Apply for various optimization techniques for dataflow analysis

Unit I

Introduction to Compliers: Compliers and Translator – Need of Translator – The structure of a Complier – Lexical analysis – Syntax analysis – Intermediate code generation – optimization – code generation – Complier – writing tools. Finite automata and lexical Analysis: The role of the lexical analysis – A simple approach to the design of lexical analysers- Regular expressions to finite automata – Minimizing the number of states of a DFA.

Unit II

The Syntactic specification of programming languages: context free grammars – derivations and parse trees – capabilities of context free grammars. Basic parsing techniques: Parsers – shift – reduce parsing – operator – precedence parsing – top down parsing – predictive parsers.

Unit III

Syntax – directed translation: syntax – directed translation schemes – implementation of syntax – directed translators – intermediate code – postfix notation – parse trees and syntax trees – 3 address code – quadruples and triples – translation of assignment statements – Boolean expressions – statements that alter the flow of control. Symbol tables: the contents of a symbol table – data structures for symbol table – representing scope information.

Unit IV

Run time storage administration: Implementation of a simple stack allocation scheme – implementation of block-structured languages – storage allocation in block structured languages. Error deduction and recovery: errors – lexical phase errors – syntactic phase errors – semantic errors.

Unit V

Introduction of code optimization: The principle sources of optimization – loop optimization – the DAG representation of basic blocks – value numbers and algebraic laws – Global data flow analysis. Code generation: Object programs – problems in code generation – a machine model – a simple code generator – register allocation and assignment – code generation from DAG's – peepholes optimization.

Suggested Readings

1. M. Ganaga Durga, T. G. Manikumar, (2019), Principles of Compiler Design, MJP Publisher,
2. Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, Koen Langendoen, Springer New York, (2012), Modern Compiler Design,
3. V. Raghavan, (2010.), Principles of Compiler Design, Tata McGraw Hill Education Publishers.
4. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, (2009), Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education.
5. Keith D Cooper and Linda Torczon, (2004), Engineering a Compile, Morgan Kaufmann Publishers Elsevier Science.
6. Steven S. Muchnick, (2003), Advanced Compiler Design and Implementation‖, MorganKaufmann Publishers – Elsevier Science, India, Indian Reprint.
7. Randy Allen, Ken Kennedy, (2002) Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publisher.

Websites

1. http://www.vssut.ac.in/lecture_notes/lecture1422914957.pdfhttps://www.iith.ac.in/~rama krishna/Compilers-Aug14/
2. https://swayam.gov.in/nd1_noc20_cs13/preview
3. https://nptel.ac.in/courses/106105190/
4. http://172.16.25.76/course/view.php?id=1847

		Semester – VI
22ITU603A	**Big Data Analytics**	**3H – 3C**

Instruction Hours / week: L: 3 T: 0 P: 0   Marks: Internal : **40** External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To provide an overview of an exciting growing field of big data analytics.
- To impart to students the skills required to design scalable systems that can accept, store, and analyze large volumes of unstructured data.
- The objective of this course is to ascertain that the students know the fundamental techniques and tools used to design and analyze large volumes of data.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.
- To understand, and practice big data analytics and machine learning approaches

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
3. Implement several Data Intensive tasks using the Map Reduce Paradigm
4. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
5. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
6. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

Unit I Introduction to Big Data

Evolution of Big data – Best Practices for Big data Analytics – Big data characteristics – Validating – The Promotion of the Value of Big Data – Big Data Use Cases- Characteristics of Big Data Applications – Perception and Quantification of Value -Understanding Big Data Storage – A General Overview of High-Performance Architecture – HDFS – MapReduce and YARN – Map Reduce Programming Model

Unit II Clustering and Classification

Advanced Analytical Theory and Methods: Overview of Clustering – K-means – Use Cases – Overview of the Method – Determining the Number of Clusters – Diagnostics – Reasons to Choose and Cautions .- Classification: Decision Trees – Overview of a Decision Tree – The General Algorithm – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Trees in R – Naïve Bayes – Bayes' Theorem – Naïve Bayes Classifier.

Unit III Association and Recommendation System

Advanced Analytical Theory and Methods: Association Rules – Overview – Apriori Algorithm – Evaluation of Candidate Rules – Applications of Association Rules – Finding Association& finding similarity – Recommendation System: Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV Stream Memory

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) applications

UNIT V No SQL Data Management for Big Data and Visualization

NoSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores – Tabular Stores – Object Data Stores – Graph Databases Hive – Sharding –-Hbase – Analyzing big data with twitter – Big data for E-Commerce Big data for blogs – Review of Basic Data Analytic Methods using R.

Suggested Readings

1. EMC Education Services (2018), "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers.
2. Bart Baesens,(2017), "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers.
3. Dietmar Jannach and Markus Zanker,(2017), "Recommender Systems: An Introduction", Cambridge University Press.
4. Kim H. Pries and Robert Dunnigan,(2016) "Big Data Analytics: A Practical Guide for Managers " CRC Press.
5. David Loshin,(2016), "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers.
6. Jimmy Lin and Chris Dyer,(2015), "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers.

Websites
1. https://www.ibm.com/analytics/big-data-analytics
2. https://www.simplilearn.com/what-is-big-data-analytics-article
3. https://www.youtube.com/watch?v=AMRDgIKcjjU

22ITU603B   **Data Science**

Semester – VI
3H – 3C

Instruction Hours / week: L: 3 T: 0 P: 0   Marks: Internal: **40**   External: **60**   Total: **100**
End Semester Exam: 3 Hours

Course Objectives (CO)

- To know the fundamental concepts of data science and analytics.
- To learn fundamental data analysis using R.
- To understand various data modeling techniques.
- To know the basics of Exploratory Data Analysis.
- To study reproducible research and various tools
- To understand, and practice big data analytics and machine learning approaches

Course Outcomes (COs)

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

1. Understand about actionable knowledge and various data analysis software
2. Know about basics in R programming language
3. Understand the need of cleaning data before analyzing
4. Understand various methods involved in exploratory data analysis
5. Know about how a research should be reproducible.
6. Apply the knowledge of R gained to data Analytics for real life applications.

Unit I - Data Scientist's Tool box

Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software; version control, markdown, git, GitHub, R and R-Studio.

Unit II - R Programming basics

Overview of R, R datatypes and Objects, reading and writing data, control structures, functions, scoping rules, dates and time, loop functions, debugging tools, simulation, code profiling.

Unit III - Getting and Cleaning Data

Obtaining data from the web, from API's, from database, and from colleagues in various formats. Basics of data cleaning and making data –tidy.

Unit IV - Exploratory Data Analysis

Essential exploratory techniques for summarizing data, applied before formal modelling commences, eliminating or sharpening potential hypotheses about the world that can be addresses by the data, common multivariate statistical techniques used to visualize high-dimensional data.

Unit V - Reproducible Research

Concepts and tools behind reporting modern data analysis in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Suggested Readings

1. Vijay Kotu, Bala Deshpande (2018), Data Science: Concepts and Practice, 2nd edition, Morgan Kaufmann publishers.

2. Hadley Wickham, Garrett Grolemund (2016), R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O' Reilly Publications

3. Rachel Schutt, Cathy O'Neil (2013). Doing data science: Straight Talk from the frontline. S.Chroff/O' Reilly

4. Foster Provost, Tom Fawcett (2013). Data science for Business – What you need to know about Datamining and Data Analytic Thinking. O'Reilly

5. John. W. Foreman (2013). Data Smart: Using Data science to transform information into insight. John Wiley and Sons.

6. Eric Seigel (2013). Predictive Analytics: The Power of Predict who will click, Buy Lie or Die (1st ed.). Wiley.

7. Matthew A.Russel (2013). Mining the social webL: Datamining Facebook, Twitter, LinkedIn, Google+, GitHub, and More (2nd ed.). O'Reilly Media

8. Ian Ayres (2007). Super Crunchers: Why Thinking – By – Numbers is the New way to Be Smart (1st ed.). Bantam

Websites

1. https://nptel.ac.in/courses/106106212/

2. http://172.16.25.76/course/view.php?id=371

22ITU611   Artificial Intelligence-Practical

<div align="right">

Semester – VI
4H – 2C

</div>

Instruction Hours / week: L:0 T: 0 P: 4   Marks: Internal : **40**   External : **60** Total: **100**
<div align="right">End Semester Exam : 3 Hours</div>

Course Objectives (CO)

- To understand the various characteristics of Intelligent agents

- To learn about the different search strategies in AI

- To learn to represent knowledge in solving AI problems

- To understand the different ways of designing software agents

- To know about the various applications of AI.

- Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.

Course Outcomes (COs)

At the end of the course, the student should be able to:

1. Identify problems that are amenable to solution by AI methods.

2. Identify appropriate AI methods to solve a given problem.

3. Formalize a given problem in the language/framework of different AI methods.

4. Implement basic AI algorithms.

5. Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.

6. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

List of Programs

Write the following programs using PROLOG

1. Program to read address of a person using compound variable.

2. Program of fun to show concept of cut operator.

3. Program to count number of elements in a list.

4. Program to find member of a set.

5. Program to concatenate two sets.

6. Program to find permutation of a set.

7. Program to demonstrate family relationship.

8. Write a program to solve Nqueens problem

9. Solve any problem using depth first search.

10. Solve any problem using best first search.

11. Solve traveling salesman problem.

Suggested Readings

1. Kevin Knight and Elaine Rich, Nair B.(2018), "Artificial Intelligence (SIE)", Mc Graw Hill.
2. Dan W. Patterson, (2017) "Introduction to AI and ES", Pearson Education.
3. Ivan Brako, (2017), PROLOG: Programming for Artificial Intelligence,3rd edition Pearson.
4. Peter Jackson (2016), "Introduction to Expert Systems", 3rd Edition, Pearson Education.
5. Stuart Russel and Peter Norvig, (2016) "AI – A Modern Approach", 2nd Edition, Pearson Education.
6. Deepak Khemani, (2015) "Artificial Intelligence", Tata Mc Graw Hill Education.

Web Sites

1. https://nptel.ac.in/courses/106/105/106105077/

Course Objectives (CO)
- To introduce students the concepts and principles of system programming
- To provide students the knowledge about both theoretical and practical aspects of system programming, teaching them the methods and techniques for designing and implementing system-level programs.
- To train students in developing skills for writing system software with the aid of sophisticated OS services, programming languages and utility tools.
- To understand the role and functioning of various system programs over application program.
- To understand the need to follow the syntax in writing an application program and to learn the how the analysis phase of compiler is designed to understand the programmer's requirements without ambiguity.
- To synthesize the analysis phase outcomes to produce the object code that is efficient in terms of space and execution time.

Course Outcomes (COs)
Upon completion of the subject, students will be able to
1. Organize the functionalities and components of a computer system into different layers, and have a good understanding of the role of system programming and the scope of duties and tasks of a system programmer
2. Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software)
3. Apply the knowledge and techniques learnt to develop solutions to realworld problems
4. Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools
5. Organize and manage software built for deployment and demonstration
6. Analyze requirements and solve problems using systematic planning and development approaches

List of Programs
1. Write a program to create a text editor.

2. Write a program to implement an absolute loader.

3. Write a program to check balance parenthesis of a given program.

4. Write a program to check the valid or invalid identifier

5. Write a program to implement DFA

6. Write a program to remove blank space in a given string.

7. Write a program to identify tokens in a given string.

8. Write a program to remove special character in a given string.

9. Write a program to check given string is a keyword or not.

10. Write a program to identify tokens in a given expression.

Suggested Readings
1. Grune, D., Van Reeuwijk, K., Bal, H. E., Jacobs, C. J. H., & Langendoen, K.(2012). Modern Compiler Design (2nd ed.). Springer
2. Santanu Chattopadhyaya. (2011). Systems Programming. New Delhi: PHI.
3. Dhamdhere, D. M. (2011). Systems Programming. New Delhi: Tata McGraw Hill.
4. Leland Beck., & Manjula, D. (2008). System Software: An Introduction to System Programming (3rd ed.). New Delhi: Pearson Education.
5. Alfred, V. Aho., Monica, S. Lam., Ravi Sethi.,& Jeffrey, D. Ullman. (2006). Compilers: Principles, Techniques, and Tools (2nd ed.). New Delhi: Prentice Hall.

		Semester – VI
22ITU612B	**Compiler Design Practical**	**4H – 2C**

Instruction Hours / week: L:0 T: 0 P: 4   Marks: Internal : **40**   External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand syntax-directed translation and intermediate code generation
- To learn to implement run-time storage administration.
- To learn to implement code optimization and code generator.
- To explore the principles, algorithms, and data structures involved in the design and construction of compilers.

Course Outcomes (COs)

Upon completion of this course, the students will be able to

1. Understand the different phases of compiler.
2. Apply different parsing algorithms to develop the parsers for a given grammar.
3. Understand syntax-directed translation and run-time environment.
4. Develop the run- time storage administration.
5. Understand to implement code optimization techniques and a simple code generator.
6. Apply for various optimization techniques for dataflow analysis

LIST OF PROGRAMS:

1. Implementation of Symbol Table
2. Implementation of Lexical Analyzer using Lex Tool
   a) The program replaces the substring abc by ABC from the given input string:
   b) Well formedness of brackets
   c) Finding vowels and consonant in a string
   d) Finding the capital
   e) It is used to display the Keywords and identifiers in the given program.
3. Construction of Operator Precedence Parse Table
4. Generate YACC specification for a few syntactic categories.
   a) Implementation Of Calculator Using Yacc.
5. Generation of code for a given intermediate code.
6. Implementation of code optimization techniques

Suggested Readings

8. M. Ganaga Durga, T. G. Manikumar, (2019), Principles of Compiler Design, MJP Publisher,
9. Dick Grune, Kees van Reeuwijk, Henri E. Bal, Ceriel J.H. Jacobs, Koen Langendoen, Springer New York, (2012), Modern Compiler Design,
10. V. Raghavan, (2010.), Principles of Compiler Design, Tata McGraw Hill Education Publishers.

11. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, (2009), Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education.
12. Keith D Cooper and Linda Torczon, (2004), Engineering a Compile, Morgan Kaufmann Publishers Elsevier Science.
13. Steven S. Muchnick, (2003), Advanced Compiler Design and Implementation‖, MorganKaufmann Publishers – Elsevier Science, India, Indian Reprint.
14. Randy Allen, Ken Kennedy, (2002) Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publisher.

Websites

1. https://studentsfocus.com/notes/anna_university/IT/6SEM/IT6612%20-%20CD%20Lab/CS6612%20-%20CD%20LAB%20%20MANUAL.pdf
2. http://www.vssut.ac.in/lecture_notes/lecture1422914957.pdfhttps://www.iith.ac.in/~rama krishna/Compilers-Aug14/
3. https://swayam.gov.in/nd1_noc20_cs13/preview
4. https://nptel.ac.in/courses/106105190/
5. .http://172.16.25.76/course/view.php?id=1847

		Semester – VI
22ITU613A	**Big Data Analytics-Practical**	**3H – 1C**

Instruction Hours / week: L:0 T: 0 P: 3   Marks: Internal : **40**   External : **60** Total: **100**
                                                    End Semester Exam : 3 Hours

Course Objectives (CO)
- To provide an overview of an exciting growing field of big data analytics.
- To impart to students the skills required to design scalable systems that can accept, store, and analyze large volumes of unstructured data.
- The objective of this course is to ascertain that the students know the fundamental techniques and tools used to design and analyze large volumes of data.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.
- To understand, and practice big data analytics and machine learning approaches

Course Outcomes (COs)
Upon completion of this course, the students will be able to
1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.
3. Implement several Data Intensive tasks using the Map Reduce Paradigm
4. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
5. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
6. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

List of Programs

1. Implement a quicksort using scala.
2. Implement an auction service using scala.
3. Write a scala function to perform any 10 arithmetic operations.
4. Write a program to find the factorial of a given number using recursion.
5. Write a program for string manipulations.
6. Write a program for alphabetic order arrangement of a set of names.
7. Write a program for student records using scala list.
8. Implement any 5 map methods for maintaining customer details.
9. Implement employee records using Files
10. Write a program to copy the files using command line arguments.

Suggested Readings

1. EMC Education Services (2018), "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers.
2. Bart Baesens,(2017), "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers.
3. Dietmar Jannach and Markus Zanker,(2017), "Recommender Systems: An Introduction", Cambridge University Press.
4. Kim H. Pries and Robert Dunnigan,(2016) "Big Data Analytics: A Practical Guide for Managers " CRC Press.
5. David Loshin,(2016), "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers.
6. Jimmy Lin and Chris Dyer,(2015), "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers.

Websites

1. https://people.cs.ksu.edu/~schmidt/705a/Scala/scala_tutorial.pdf
2. https://www.tutorialspoint.com/scala/scala_tutorial.pdf
3. https://people.cs.ksu.edu/~schmidt/705a/Scala/Programming-in-Scala.pdf
4. https://www.cs.rice.edu/~javaplt/411/12-fall/Lectures/ScalaBasics.pdf

22ITU613B   **Data Science-Practical**

Instruction Hours / week: L: 0 T: 0 P: 3   Marks: Internal : **40**   External : **60** Total: **100**

End Semester Exam : 3 Hours

Course Objectives (CO)

- To know the fundamental concepts of data science and analytics.
- To learn fundamental data analysis using R.
- To understand various data modeling techniques.
- To know the basics of Exploratory Data Analysis.
- To study reproducible research and various tools
- To understand, and practice big data analytics and machine learning approaches

Course Outcomes (COs)

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

1. Understand about actionable knowledge and various data analysis software
2. Know about basics in R programming language
3. Understand the need of cleaning data before analyzing
4. Understand various methods involved in exploratory data analysis
5. Know about how a research should be reproducible.
6. Apply the knowledge of R gained to data Analytics for real life applications.

List of Programs

1. Write a program that prints 'Hello World' to the screen
2. Write a program that asks the user for a number n and prints the sum of the numbers 1 to n.
3. Write a program that prints multiplication table for numbers upto 12.
4. Write a function that returns the largest element in a list
5. Write a function that computes the running total of a list
6. Write a function that tests whether string is a palindrome.
7. Implement linear search
8. Implement binary search
9. Implement matrix addition, subtraction and multiplication
10. Fifteen students were enrolled in a course
    There ages were : 20 20 20 20 20 21 21 21
    22 22 22 22 23 23 23
    i. Find the median age of all students under 22 years.
    ii. find the median age of all students
    iii. Find the mean age of all students
    iv. Find the modal age of all students
    v. Two more students enter tha class. The age of both students is 23. What is now mean, mode and median.

11. Following table gives frequency distribution of systolic blood pressure. Compute all the measures of dispersion.

Midpoint	95.5	105.5	115.5	125.5	135.5	145.5	155.5	165.5	175.5
Number	5	8	22	27	17	9	5	5	2

12. Obtain probability distribution of, where X is number of spots showing when a six-sided symmetric die (i.e. all six faces of the die are equally likely) is rolled.
    Simulate random samples of sizes 40,70 and 100 respectively and verify the frequency interpretation of probability.
13. Make visual representations of dats using the base, lattice abd ggplot2 plotting ssytems in R, apply basic principles of data graphics to create rich analytic graphics from available datasets.
14. Use Git/GitHub software to create Github Account. Also, create a repo using Github.

Suggested Readings

1. Vijay Kotu, Bala Deshpande (2018), Data Science: Concepts and Practice, 2nd edition, Morgan Kaufmann publishers.

2. Hadley Wickham, Garrett Grolemund (2016), R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O' Reilly Publications

3. Rachel Schutt, Cathy O'Neil (2013). Doing data science: Straight Talk from the frontline. S.Chroff/O' Reilly

4. Foster Provost, Tom Fawcett (2013). Data science for Business – What you need to know about Datamining and Data Analytic Thinking. O'Reilly

5. John. W. Foreman (2013). Data Smart: Using Data science to transform information into insight. John Wiley and Sons.

6. Eric Seigel (2013). Predictive Analytics: The Power of Predict who will click, Buy Lie or Die (1st ed.). Wiley.

7. Matthew A.Russel (2013). Mining the social webL: Datamining Facebook, Twitter, LinkedIn, Google+, GitHub, and More (2nd ed.). O'Reilly Media

8. Ian Ayres (2007). Super Crunchers: Why Thinking – By – Numbers is the New way to Be Smart (1st ed.). Bantam

Websites

1. https://nptel.ac.in/courses/106106212/
2. http://172.16.25.76/course/view.php?id=371

Semester – VI

22ITU691   **Project**   **8H – 6C**

Instruction Hours / week: L:0 T: 0 P: 8   Marks: Internal : **40**   External : **60** Total: **100**

End Semester Exam : 3 Hours

VALUE ADDED COURSES

S.No	Name of the Value-Added Course
1.	Data Analytics
2.	Artificial Intelligence
3.	Internet of things
4.	PC Assembling and Troubleshooting
5.	Android Application Development
6.	Photoshop
7.	Web Designing
8.	Selenium
9.	Cyber Forensics
10.	Network Programming with Cisco Packet Tracer Tool
11.	Database Design and Administration