ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
(Choice Based Credit System)

R20

Artificial Intelligence Data Science

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for batches admitted from 2020-2021)

SWARNANDHRA

COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

ACADEMIC REGULATIONS

1. INTRODUCTION

Swarnandhra College of Engineering & Technology (**Subsequently referred to as SCET**) will be followed the norms of Jawaharlal Nehru Technological University Kakinada and Govt. of Andhra Pradesh.

All Academic Programme rules and regulations are approved by the Academic Council, which is the highest Academic body of the Institute. It is applicable for all Bachelor of Technology (B. Tech) degree programme from academic year 2020-21.

2. ADMISSIONS

2.1 Regular Admission

(Join in first year B. Tech Programme)

Admissions in the Institution are classified into **CATEGORY – A,** through convener, EAMCET and **CATEGORY- B** filled by the college management.

2.2 Lateral Entry Admission

(Join in the Second year/third semester of B. Tech Programme)

Eligibility: Diploma in Engineering / B.Sc Degree with Mathematics as one course .

Based on the rank secured by the candidate at Engineering Common Entrance Test (ECET) conducted by APSCHE, Government of Andhra Pradesh.

2.3 Advance standing Admission

(Transfer from other Colleges/ Re-admission due to dis-continuation)

These may arise in the following cases:

a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
b) When students of SCET get transferred from one regulation to another regulation.

In all such cases, approval is mandatory from the statutory bodies

3. UNDER GRADUATE (UG) PROGRAMMES OFFERED

The College is offering the following programs:

- Computer Science and Engineering (CSE)
- Electronics and communication Engineering (ECE)
- Electrical and Electronics Engineering (EEE)
- Information Technology (IT)
- Mechanical Engineering (ME)
- Civil Engineering (CE)
- Artificial Intelligence and Machine Learning (AI&ML)
- Artificial Intelligence and Data Science (AI&DS)
- Robotics (ROBO)

3.1 Structure of the Programme:

i) **Preamble:**

It is emphasized in UGC Guidelines on Choice Based Credit System (CBCS), that the important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. It is adopted grading system in place of conventional system of marks and percentages.

CBCS provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The students can register any course of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach through open electives.

Key words CBCS, such as Course, credit, credit point, CGPA, SGPA, Grade Point, Letter Grades as given in the UGC guidelines are used the same definitions.

Each Programme consists of:

i). Foundation courses in Basic Sciences, Engineering Sciences, Humanities and social science including management courses.
ii). Professional core Courses to impart broad knowledge.
iii). Professional Elective Courses from the discipline or interdisciplinary areas / industry related opted by the student based on their interest in specialization.
iv). Open Elective Courses from the interdisciplinary areas opted by the students based on their interest in specialization.
v). Mandatory Courses, Internship, Seminar, Project work.
vi). Skill Oriented Courses to upskilling the graduates on the skills relevant to the need and demands of the industry.

Each Programme designed to have 35-40 theory courses, 20-25 laboratory courses and 05 Skill Oriented Courses. The categories of courses are indicated in the following table.

A three-week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

TABLE-1 CATEGORY OF COURSES

S.No	Category	Code
1	Humanities and social science including Management courses	HSMC
2	Basic Science courses	BSC
3	Engineering courses science	ESC
4	Professional core Courses	PCC
5	Open Elective Courses	OEC
6	Professional Elective Courses	PEC
7	Internship, seminar, project work	PROJ
8	Skill Oriented Courses	SC
9	Laboratory Courses	LC
10	Mandatory courses	MC

Note: All components prescribed in the curriculum will be conducted and evaluated.

MOOCS: A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

ii) **Contact hours:** Depending on the complexity and volume of the course, the number of contact hours per week will be determined.

iii) **Credits:**

TABLE-2 CREDITS BASED ON CONTACT HOURS

Course type	No. of Contact Hours	No. of Credits
Theory	1	1
Practical	2	1

TABLE-3 CREDITS FOR DIFFERENT COURSES

Course type	Lecture method			Credits
	L	T	P	C
Theory/Elective	2	1	0	3
	3	0	0	3
	2	0	2	3
	2	0	0	2
Laboratory	0	0	2	1
	0	0	3	1.5
	0	0	4	2
Skill Oriented Courses	1	0	2	2

3.2 Curriculum for each Programme:

- All Four year B. Tech Programme of study is formulated based on the guidelines mentioned in 3.1 and recommended by the concerned Board of Studies (BoS) and approved by the Academic Council (AC).
- The same curriculum will be applicable for lateral entry students from 3 rd semester onwards.
- For advance standing admission, the equivalent curriculum will be prepared by BoS and approved by AC.

4 DURATION OF THE PROGRAMME:

The duration of the B. Tech. Programme is four academic years consisting of eight semesters. Students, who fail to fulfill all the academic requirements for the award of the degree within the prescribed duration as per article 4.1, will forfeit their admission in B. Tech**.**

4.1 Maximum duration of study.

Maximum duration permitted for completion of the B. Tech. Programme of study will be:

Regular Admission: Eight academic years in sequence from the year of admission for a student admitted into first year of any Programme.

Lateral Entry Admission: Six academic years in sequence from the year of admission for a student admitted into second year of any Programme.

Advanced standing Admission: The maximum time for completion of Programme of study, will be twice the period in terms of academic years in sequence, with prescribed curriculum.

TABLE- 4 MAXIMUM DURATION OF STUDY

Admitted year of study	Maximum duration
First year	8 Academic years in sequence
Second year (Lateral entry)	6 Academic years in sequence
Advanced standing	Twice the period in terms of academic years in sequence

4.2 Cancellation of Admission :

In case candidate fails the above conditions for the award of degree, admission stands cancelled.

5 MEDIUM OF INSTRUCTION :

The medium of instruction and examinations are in English.

6 MINIMUM INSTRUCTION DAYS: Each semester will consist of 22 weeks duration with minimum of 110 working days which includes instruction days, internal tests and End examinations.

7 TRANSITORY REGULATIONS (Admitted under advance standing)**:**

The following regulations will be followed the operandi. At the time of such admission, based on the Programme pursued (case by case)

- Discontinued or detained candidates are eligible for re-admission in subsequent years in the same semester.
- The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted.

In case of transferred students from other colleges, credits shall be transferred to SCET as per the academic regulations and course structure of SCET.

8 DISTRIBUTION AND WEIGHTAGE OF MARKS:

Each semester consists of 4/5/6 theory courses and 4/3/2 Laboratory courses. However, in the 8th semester there will be only project work / internship in industry.

(a). **Theory Courses:**

- Each course consists of five units.
- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- The internal evaluation of 30 marks consists of Two Mids for 20 marks and Five class tests for 10 marks.
- Mid Examination: Each mid examination will be conducted for 20 marks with the duration of 75 Minutes. Internal test paper consists of three questions (8M+8M+4M) from two and half units and all are to be answered.
- **Weighted average of two Mids** performance will be considered, weightage of 80% for the best Mid marks and 20% for the second.
- **Class tests for 10 marks calculation**: There will be one class test conducted in each unit. Average of **Best three** will be considered.
- The **end semester** examination will be conducted for 70 marks which covers full syllabus. In end examination pattern, **Part – A** consists of five short questions from all units (Brainstorming/Thought provoking/Case study) for 10 marks. **Part – B** has **5 questions** with internal choice from each unit and valued for 60 marks.
- Internal Marks will be considered for three academic years only if the candidates will not completed the concern course because of less than 12 internal marks. Thereafter the candidate writes external examination for 70 which will be converted to 100 but the candidate must get minimum 40 %.

(b). **Practical Courses:**

- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- End practical examination will be conducted by the internal and external examiner appointed by COE.
- Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

(c). **Design or Engineering Drawing Marks Distribution:** For the courses of design or drawing such as Engineering Graphics, etc., the distribution will be 30 marks for internal evaluation with 10 marks for day-to-day work, and 20 marks from two internal test (80% of first best + 20% of second best). End examination will be conducted for 70 marks.

(d) **Summer Internship:** It can be carried out with a minimum of Six weeks and maximum Eight weeks duration at end of 4^{th} semester and 6^{th} semester. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. It will be evaluated internally by an internal evaluation committee comprising of Head of the Department and two faculty of the department. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightage respectively. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits

(e) **Full Internship and Project Work:** The 8th Semester Project Work with full internship will be evaluated for 200 Marks. The project work is evaluated for internal assessment of 60 and external Examination for 140. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

i) Internal Assessment: Internal Assessment will be monitored by Project Review Committee consists of Head of the Department , Supervisor and Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

ii) External Examination: External Examination will be conducted by Project external examination committee consists of Head of the Department, Supervisor and External examiner appointed by CoE , through presentation / viva - voce by the student.

9. Community Service Project (Experiential Learning through Community Engagement):

Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development. Community Service Project is meant to link the community with the college for mutual benefit. Community Service Project is an integral part of the curriculum with 4 Credits and evaluated internally for 100 marks.

Objectives:

- To sensitize the students to the living conditions of the people who are around them,
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project:

1. Every student should put in a minimum of 180 hours for the Community Service Project during the summer/ Semester vacation.
2. Each class/section should be assigned with a mentor
3. Specific Departments could concentrate on their major areas of concern.
4. A log book has to be maintained by each of the student, where the activities undertaken / involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty incharge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS / NCC / Green Corps / Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. The Project Log-, Project Implementation, Project report and Presentation shall carry 20%, 30%, 25% and 25% weightage respectively. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

TABLE- 5 MARKS ALLOCATION

Course type	Marks Allocation			
	Internal		End Semester	Total
	Internal test	Class Test/ Day to day work		
Theory course	20	10	70	100
Laboratory course	15	15	70	100
Design or Drawing course	20	10	70	100
Skill Oriented Courses	15	15	70	100
Summer Internship	50		-	50
Community Service Project	100		-	100
Project Work	60		140	200

(f) **Mandatory Courses**:
These courses are compulsory with zero credits. Only internal examination will be conducted and student has to secure minimum 40% of the marks in the evaluation for passing the course. The minimum attendance requirement is 75 %.

(g) **Open Electives:** Students are to choose Open Elective – I during 5th Semester, Open Elective–II during 6th Semester and Open Elective – III and IV during 7th Semester from the list of Open Electives given in the Course Structure. However, students cannot opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the courses offered by the parent Department in any Semester.

(h) **Skill Oriented Courses:**

i) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering.

ii) For these courses, one theory and two practical hours may be allotted as approved by the concerned BOS.

iii) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the concerned BoS.

iv) Every year the concerned BoS review the skill oriented courses based on industrial demand which are offered by the eligible external agencies and college.

v) Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination. End examination will be conducted by the internal and external examiner appointed by COE. Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

vi) If a student chooses a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded depends on the Course Completion Certificate.

vii) College academic committee evaluates the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

viii) There are five (05) skill-oriented courses shall be offered during III to VII semesters.

ix) Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

10. ATTENDANCE REQUIREMENTS

(i) A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the courses.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.

(iii) Shortage of Attendance below 65% in aggregate shall not be condoned.

(iv) Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for previous semesters examinations shall be allowed.

(v) Attendance may also be condoned for those who participate in Inter Collegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/ She shall pay the prescribed Condonation fee.

(vi) Prescribed Condonation fee shall be payable by the student to appear for the end examination.

(vii) A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively.

(viii) A student will be condoned only four times for regular student and three times for lateral entry students during entire course of study.

(ix) For induction programme attendance shall be maintained as per AICTE norms.

TABLE-6 ATTENDANCE REQUIREMENT

Attendance Percentage	Condonation fee	Appear End Exams
Above 75 %	Nil	Eligible
65 % -75%	Yes (on medical grounds)	Eligible
Below 65 %	Nil	Not Eligible (Seek re-admission to that semester when offered)

11. MINIMUM ACADEMIC REQUIREMENTS:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in **S.No.10.**

(i) A student will be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project if he/she secures not less than a minimum of 35% of marks exclusively in the end semester examinations in each of the courses, for which the candidate had appeared. However, the candidate should have secured a minimum of 40% marks in both external and internal components put together to declare eligible for pass..

(ii) A student will be promoted from first semester to second semester, second semester to third and third to fourth semester, if he/she satisfies the minimum attendance requirement.

(iii) A student will be promoted from 4^{th} to 5^{th} Semester (2^{nd} year to 3^{rd} year), if he/she fulfills the academic requirements of 40% of the credits up to either 3^{rd} or 4^{th} Semester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.

(iv) A student will be promoted from 6^{th} to 7^{th} Semester (3^{rd} year to 4^{th} year), only if he/she fulfills the academic requirements of 40% of the credits up to either 5^{th} or 6^{th} Semester from, all the examinations (regular and supply) whether or not the candidate takes the examinations.

(v) When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

TABLE-7 PROMOTION IN TO NEXT HIGHER CLASS

Promotion		Promotion Criteria
From	To	
1ST Semester	2nd Semester	Minimum Attendance requirement
2nd Semester	3rd Semester	
3rd Semester	4th Semester	
4th Semester	5th Semester	Minimum Attendance requirement & 40% of credits up to either 3rd or 4th semester from all exams
5th Semester	6th Semester	Minimum Attendance requirement
6th Semester	7th Semester	Minimum Attendance requirement & 40% of credits up to either 5th or 6th semester from all exams
7th Semester	8th Semester	Minimum Attendance requirement

12. GAP YEAR CONCEPT

Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year study, after the 4th Semester with the due recommendations of the GAP committee and approved by the principal. This may be extended to two years at the most which period is not counted for the maximum time for graduation.

13. AWARD OF B.TECH DEGREE:

A student shall be eligible for award of the B.Tech. Degree if he/she fulfills all the following conditions:

(i) Pursue the programme of study for a stipulated period of four years and not more than eight years.

(ii) Register for 160 credits and secure the same.

(iii) Registered and successfully completed all the components prescribed in the programme of study in which he/she is admitted.

(iv) All mandatory courses must be completed with satisfactory.

(vi) Obtained CGPA greater than or equal to 5.0 (minimum requirements for pass).

(vii) A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

(viii) All students shall register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during first two years. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

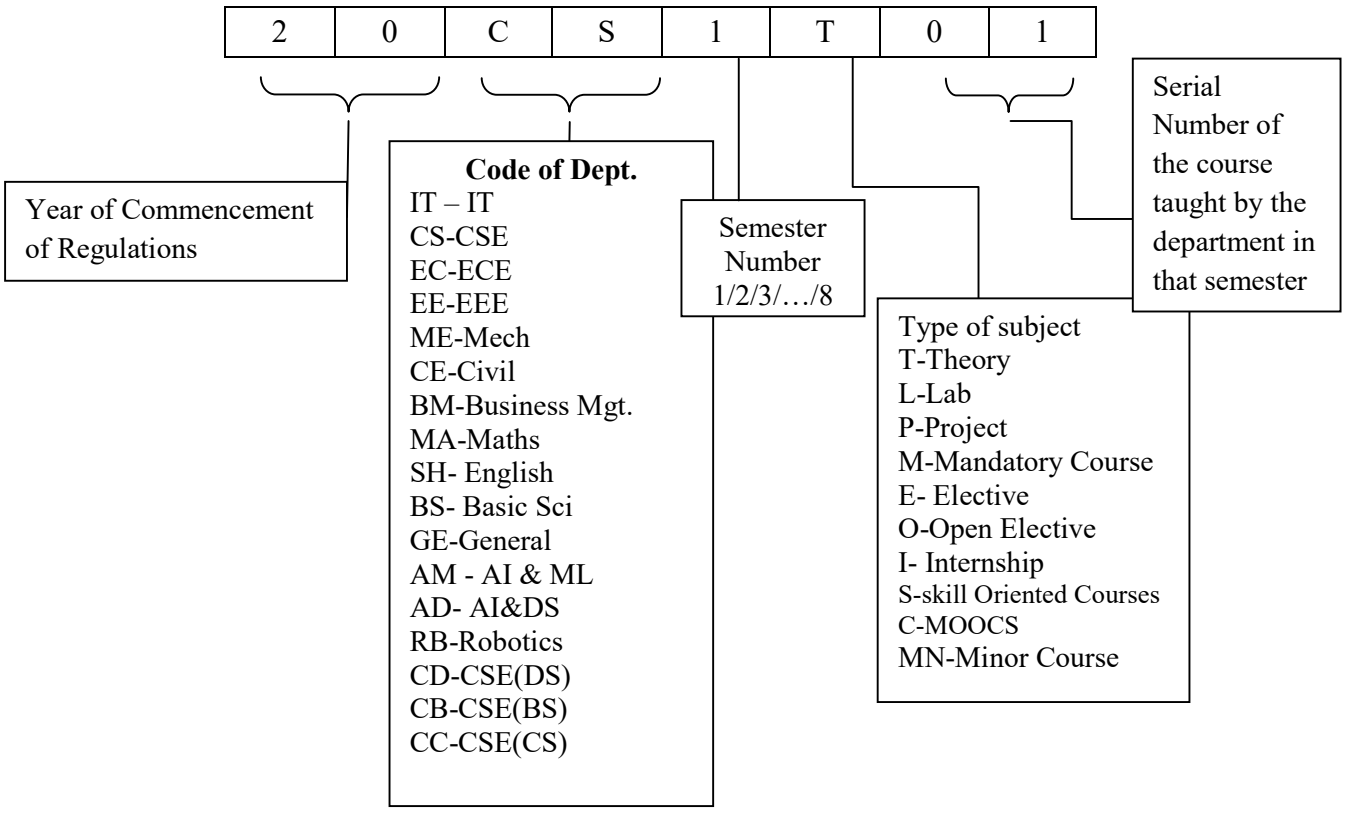
(ix) Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

14. AWARD OF B. TECH. (HONOR)/B. TECH. (MINOR):

B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. Registering for Honors/Minor is optional. (Refer Sl.No 24 & 25)

15. COURSE CODE & COURSE NUMBERING SCHEME:

The subject codes will be given by the department teaching the subject. Each subject code contains 8 characters. The 8 characters for each subject will be filled as per the following guidelines.



16. GRADING SYSTEM:

16.1 Award of Grade:

(i) Semester Grade Point Average (SGPA):

a) The Semester Grade Point Average (SGPA) will be calculated according to the formula

$$\text{SGPA (Si)} = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the subject i

G_i = grade points obtained by the student in the subject.

b) To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

$$\text{CGPA} = \frac{\sum C_i S_i}{\sum C_i}$$

where 'Si' is the SGPA of the ith semester and Ci is the total number of credits in that semester

i. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

ii. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

iii. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.

iv. Equivalent Percentage = (CGPA – 0.75) x 10

(ii) After a student satisfy the requirements prescribed for the award of B.Tech Programme he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point scale of 10 and given in Table 8.

Table -8

CGPA	Award of Division
≥ 7.75	First Class with Distinction (Without any supplementary appearance)
≥ 6.75 < 7.75	First Class
≥ 5.75 < 6.75	Second Class
≥ 5.00 < 5.75	Pass Class

16.2 Award of Grade in Each Semester:

(i) Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table 10.

Table -9

Percentage of Marks Scored	Letter Grade	Level	Grade Points
>=90	A+	Outstanding	10
80 - 89	A	Excellent	9
70-79	B	Very Good	8
60-69	C	Good	7
50-59	D	Fair	6
40-49	E	Satisfactory	5
<40	F	Fail	0
	Ab	Absent	0

(ii) A student earns a minimum of 5 grade points in a subject is declared to have successfully completed the subject, and is deemed to have earned the credits assigned to that subject. However, it should be noted that a pass in any subject/Internship/project/ shall be governed by the rules mentioned in **S.No. 13**.

(iii) Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his/her performance in all courses taken in that semester and also indicating the grades.

(iv) Transcripts: After successful completion of the programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to the student on request and by paying stipulated fee in force.

(v) Candidates shall be permitted to apply for revaluation within the stipulated period with payment of prescribed fee.

(vi) The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

17. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

i. The students have to acquire 121 credits from 3rd Semester to 8th Semester of Program (regular) for the award of the degree.

ii. Students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

iii. The same attendance regulations are to be adopted as per the rules mentioned in item No.9.

iv. **Rules for Promotion in to Next Higher Class:** (6th Semester to 7th Semester): A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to either 5th or 6th Semester.

18. SUPPLEMENTARY EXAMINATIONS:

In addition to the Regular Final Examinations held at the end of each semester, a Supplementary Examination will be conducted. A student can appear for any number courses of supplementary examinations till he/she clears the courses. However the maximum stipulated period of programme cannot be relaxed under any circumstance.

19. ADVANCED SUPPLEMENTARY EXAMINATIONS:

Candidate who fails the courses in 7th and 8th Semester can appear for Advanced Supplementary Examinations.

20. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):

i. The students have to acquire 121 credits from 3rd Semester to 8th Semester of B. Tech Programme for the award of the degree.
ii. All mandatory courses must be completed with satisfactory for award of degree.
iii. Obtained CGPA greater than or equal to 4.5 (minimum requirements for pass).
iv. The same attendance regulations are to be adopted as per the rules mentioned in item No.09.
v. **Rules for Promotion from 6th Semester to 7th Semester**: A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to 6th Semester.
vi. Students, who fail to fulfill the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.

21. CONDUCT AND DISCIPLINE:

Students admitted in SCET are to be followed the conduct and discipline of the college and which will be updated from time to time.

22. MALPRACTICES:

If any malpractices held in internal assessment tests or Semester-End Examinations, Principal constitute a Malpractice Enquiry Committee to enquire the case. The principal shall take necessary action based on the recommendations of the committee as per stipulated norms.

23. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

24. HONORS PROGRAMME:

a) Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

b) A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 7.75 CGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

c) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

d) In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

e) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

f) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

g) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

h) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

i) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.

j) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

k) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

25. <u>MINOR PROGRAMME:</u>

a) **i**) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme; he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

ii) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

c) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

d) A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 7.75 CGPA (Cumulative Grade Point Average) upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 7.75 CGPA upto 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An CGPA of 7.75 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

e) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

f) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

g) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

h) Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

i) College Academic committee evaluates the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

j) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

k) In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

l) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

26. GENERAL:

a) Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
b) The academic regulation should be read as a whole for the purpose of any interpretation.
c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final and which is to be ratified by the Chairman of the Governing Body.
d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

SEMESTER-I

S. No.	Course Type	Course Title	L	T	P	C	IM	EM	TM
1	20MA1T01	Linear Algebra	3	0	0	3	30	70	100
2	20BS1T01	Engineering Physics	3	0	0	3	30	70	100
3	20HS1T01	English	3	0	0	3	30	70	100
4	20CS1T01	Problem Solving Using C Programming	3	0	0	3	30	70	100
5	20BS1L01	Engineering Physics Lab	0	0	3	1.5	30	70	100
6	20HS1L01	English Proficiency Lab	0	0	3	1.5	30	70	100
7	20CS1L01	C Programming Lab	0	0	3	1.5	30	70	100
8	20IT1L01	IT Work shop	0	0	3	1.5	30	70	100
		Total	**12**	**0**	**12**	**18**	**240**	**560**	**800**

SEMESTER-II

S. No.	Course Type	Course Title	L	T	P	C	IM	EM	TM
1	20MA2T02	Differential Equation and Numerical Methods	3	0	0	3	30	70	100
2	20BS2T02	Engineering Chemistry	3	0	0	3	30	70	100
3	20CS2T03	Object Oriented Programming with Python	3	0	0	3	30	70	100
4	20IT2T01	IT Essentials	3	0	0	3	30	70	100
5	20EE2T01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
6	20CS2L03	Object Oriented Programming Lab with Python	0	0	3	1.5	30	70	100
7	20EE2L01	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5	30	70	100
8	20BS2L02	Engineering Chemistry Lab	0	0	3	1.5	30	70	100
9	20HS2L02	English Communication Lab	0	0	3	1.5	30	70	100
		Total	**15**	**0**	**12**	**21**	**270**	**630**	**900**

Category	Sem-I Credits	Sem-II Credits
Basic Science Courses (BSC)	7.5	7.5
Engineering Science Courses (ESC)	6.0	12
Humanities and Social Science (HSC)	4.5	1.5
Total Credits	**18**	**21**

SEMESTER-III

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20MA3T07	Probability And Statistics	3	-	-	3.0	30	70	100
2	20AM3T01	Data Structures and Algorithms	3	-	-	3.0	30	70	100
3	20CS3T02	Database Management System	3	-	-	3.0	30	70	100
4	20CS3T03	Computer Organization and Architecture	3	-	-	3.0	30	70	100
5	20CD3T01	Data Science	3	-	-	3.0	30	70	100
6	20AM3L01	Data Structures and Algorithms Lab	-	-	3	1.5	30	70	100
7	20CS3L02	Database Management Systems Lab	-	-	3	1.5	30	70	100
8	20CD3L01	Data science Lab	-	-	3	1.5	30	70	100
9	20CD3S01	R Programming Lab	1	-	2	2.0	30	70	100
10	20CE3M01	Environmental Sciences	2	-	-	-	-	-	-
		Total	**18**	**-**	**11**	**21.5**	**270**	**630**	**900**

SEMESTER-IV

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20IT4T01	Discrete Mathematics	3	-	-	3.0	30	70	100
2	20CS4T01	Operating Systems	3	-	-	3.0	30	70	100
3	20AD4T02	Artificial intelligence	3	-	-	3.0	30	70	100
4	20CD4T01	Data Mining and Data Warehousing	3	-	-	3.0	30	70	100
5	20BM4T01	Managerial Economics and Financial Analysis	3	-	-	3.0	30	70	100
6	20AD4L01	Artificial intelligence Lab	-	-	3	1.5	30	70	100
7	20CS4L02	Operating systems Lab	-	-	3	1.5	30	70	100
8	20CD4L03	Data Mining and Data Warehousing Lab	-	-	3	1.5	30	70	100
9	20AM4S01	Mobile Application Development Lab	1	-	2	2.0	30	70	100
10	20BM4M01	Indian Constitution	2	-	-	-	-	-	-
11	20AD4C01	Community Service Project	-	-	-	4.0	-	0	100
		Total	**18**	**-**	**11**	**25.5**	**270**	**630**	**1000**
Internship 2 Months (Mandatory) and Community Service Project during summer vacation									

Category	Sem-III Credits	Sem-IV Credits
Basic Science Courses	3	3
Engineering Science Courses	16.5	16.5
Skill Oriented Course	2	2
Community Service Project	-	4
Total Credits	**21.5**	**25.5**

SEMESTER-V

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20AD5T01	Machine Learning	3	0	0	3.0	30	70	100
2	20CD5T01	Automata Theory and Compiler Design	3	0	0	3.0	30	70	100
3	20CS5T01	Computer Networks	3	0	0	3.0	30	70	100
4		**Professional Elective-I**	3	0	0	3.0	30	70	100
5		**Open Elective-I / Job Oriented Elective - I**	2	0	2	3.0	30	70	100
6	20AD5L01	Machine Learning Lab	0	0	3	1.5	30	70	100
7	20CS5L01	Computer Networks Lab	0	0	3	1.5	30	70	100
8	20HS5S01	Advanced Communication Skills Lab	1	0	2	2.0	30	70	100
9	20BM5M01	Essence of Indian Traditional Knowledge	2	-	-	-	-	-	-
10	20AD5I01	Internship- I	-	-	-	1.5	50	0	50
		TOTAL Credits	**17**	**0**	**10**	**21.5**	**290**	**560**	**850**

CATEGORY	CREDITS
Professional Core Courses	12
Professional Elective Courses	3
Open Elective Courses	3
Skill Oriented Course	2
Summer Internship	1.5
Total Credits	**21.5**

PROFESSIONAL ELECTIVE – I

S.No	Course Code	Course Title	Semester
1	20AD5E01	Computer Vision	V
2	20AD5E02	Data Science on Cloud	V
3	20AD5E03	Internet of Things	V
4	20CD5E01	Advanced Data Structures and Algorithms	V
5	20CD5E02	Cloud Computing	V
6	20AM5E01	Principles Of Software Engineering	V

OPEN ELCTIVE-I

S. No	Course Code	Course Title	Offering Dept.
1	20EE5O01	Non-conventional Energy sources	EEE
2	20ME5O01	Waste to Energy Conversion	ME
3	20CS5O01	Internet of Things and Applications	CSE
4	20CS5O02	Data Engineering	CSE
5	20BM5O01	Innovations and Entrepreneurship	MBA
6	20BM5O03	Digital Marketing	MBA
7	20BM5O04	Business Environment	MBA

JOB ORIENTED ELCTIVE-I

S. No	Course Code	Course Title	Offering Dept.
1	20IT5J01	Linux Administration	IT
2	20CS5J01	Full Stack with JAVA	CSE

SEMESTER – VI

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20AM6T01	Deep Learning	3	0	0	3.0	30	70	100
2	20CD6T01	Data Visualization Techniques	3	0	0	3.0	30	70	100
3	20AD6T01	Big Data Analytics	3	0	0	3.0	30	70	100
4		Professional Elective-II	3	0	0	3.0	30	70	100
5		**Open Elective/ Job Oriented Elective- II**	2	0	2	3.0	30	70	100
6	20AD6L01	Big Data Analytics Lab	0	0	3	1.5	30	70	100
7	20CD6L01	Data Visualization Lab	0	0	3	1.5	30	70	100
8	20AM6L01	Deep Learning Lab	0	0	3	1.5	30	70	100
9	20CD6S01	NOSQL	1	0	3	2	30	70	100
10	20MB6M01	Professional Ethics and Intellectual Property Rights	2	-	-	-	-	-	-
		TOTAL	**18**	**0**	**13**	**21.5**	**240**	**560**	**900**

CATEGORY	CREDITS
Professional Core Courses	9
Professional Elective Courses	3
Open Elective Courses	3
Skill Oriented Course	6
Engineering Courses	4.5
Total Credits	**21.5**

PROFESSIONAL ELECTIVE – II

S.No	Course Code	Course Title	Semester
1	20AD6E01	Digital Image Processing	VI
2	20AD6E02	Object Oriented Analysis and Design	VI
3	20AD6E03	Geographical information system	VI
4	20AM6E02	Ethics of Artificial Intelligence	VI
5	20CD6E01	Computer Graphics	VI
6	20CD6E02	Operations Research	VI

OPEN ELECTIVE – II

S. No	Course Code	Course Title	Offering Dept.
1	20CE6O01	Environmental Pollution and Control	CE
2	20CE6O02	Disaster Management	CE
3	20EE6O01	Fundamentals of Electrical Vehicle	EEE
4	20EC6O01	Mobile Communication and its Applications	ECE
5	20ME6O01	Basics of 3D Printing	MECH
6	20ME6O02	Farm Machinery	MECH
7	20CS6O01	Principles of Software Engineering	CSE
8	20CS6O02	Fundamentals of Computer Networks	CSE
9	20BM6O01	Stress and Work Life Management	MBA
10	20BM6O02	Banking and Insurance	MBA
11	20MA6O01	Operation Research	S&H
12	20IT6O01	Introduction to Cloud Computing	IT
13	20AD6O01	Natural Language Processing	AIDS

JOB ORIENTED ELECTIVE – II

S.No	Course Code	Course Title	Offering Dept.
1	20CS6J01	AWS Cloud Practitioner	CSE
2	20CS6J02	Software Testing Tools	CSE
3	20IT6J01	Full Stack Development	IT
4	20IT6J02	Block Chain Technology	IT

SEMESTER – VII

S. No.	Course Code	Course Title	L	T	P	C	IMS	EM	TM
1		Professional Elective-III	3	0	0	3.0	30	70	100
2		Professional Elective-IV	3	0	0	3.0	30	70	100
3		Professional Elective-V	3	0	0	3.0	30	70	100
4		Open Elective – III /Job Oriented Elective-III	3	0	0	3.0	30	70	100
5		Open Elective – IV /Job Oriented Elective-IV	3	0	0	3.0	30	70	100
6	20HS7T01	Humanities and Social Science Elective Universal Human Values : Understanding Harmony	3	0	0	3.0	30	70	100
7	20AM7S01	Skill Course : RESTful API Design with Node, Express, and MongoDB	-	-	-	2.0	30	70	100
8	20CD7I01	Internship - II	-	-	-	3.0	50	-	50
		TOTAL				**23**	**260**	**490**	**750**

CATEGORY	CREDITS
Professional Elective Courses	9
Open Elective/Job Oriented Courses	6
Humanities and Social Science Elective	3
Skill Advanced Course	2
Summer Internship	3
Total Credits	**23**

PROFESSIONAL ELECTIVE – III

S. No.	Course Code	Course Title	Semester
1	20CS7E01	Cryptography and network security	VII
2	20AM7E02	Reinforcement Learning	VII
3	20AD7E01	Nature Inspired Computing Techniques	VII
4	20CD7E01	Software Testing Methodologies	VII
5	20AM7E01	Block Chain Technologies	VII
6	20EC7E03	Speech Processing	VII

PROFESSIONAL ELECTIVE – IV

S. No.	Course Code	Course Title	Semester
1	20AD7E02	Information Retrieval Systems	VII
2	20AM7E04	Robotic Process Automation	VII
3	20AM7E05	Video Analytics	VII
4	20AD7E03	Web Mining	VII
5	20CD7E02	Generative AI	VII
6	20CD7E03	Human Computer Interface	VII

PROFESSIONAL ELECTIVE – V

S. No.	Course Code	Course Title	Semester
1	20AM7E06	AI Chatbots	VII
2	20AM7E07	Social Networks Analysis	VII
3	20AD7E04	Graph Machine Learning	VII
4	20AD7E05	Augmented Reality and Virtual Reality	VII
5	20CD7E04	Recommender System	VII
6	20CD7E05	ETL principles	VII

OPEN ELECTIVE – III

S. No	Course Code	Course Title	Offering Dept.
1	20CE7O01	Solid Waste Management	CIVIL
2	20CE7O02	Building Planning and Drawing	CIVIL
3	20EE7O01	Energy Auditing, Conservation and Management	EEE
4	20EC7O01	Introduction to Global Positioning Systems	ECE
5	20BM7O01	Industrial Sociology and Psychology	MBA
6	20ME7O01	Bio-Mechanical Engineering	MECH
7	20CS7O01	Full-Stack Development	CSE

OPEN ELECTIVE – IV

S. No	Course Code	Course Title	Offering Dept.
1	20CE7O03	Introduction to Watershed Management	CIVIL
2	20EE7O02	Introduction to Programmable Logic Controller	EEE
3	20BM7O02	Business Skill Development	MBA
4	20EC7O02	Remote Sensing	ECE
5	20ME7O02	Green Engineering System	MECH
6	20CS7O02	Software Testing Techniques	CSE
7	20IT7O01	Introduction to Software Project Management	IT

SEMESTER – VIII

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20AD8P01	Project (Project work, seminar and internship in industry)	-	-	-	8	60	140	200
		Total				**8**	**60**	**140**	**200**
2	20AD8M01	Data Visualization with Power BI	3	1	0	4	30	70	100
3	Minor	Mini-Project	-	-	-	4	30	70	100

SUBJECTS FOR B. TECH. (MINOR) in AIDS

S.NO	CODE	SUBJECT	L-T-P	CREDITS
1	20AD4M01	Evolution of Artificial Intelligence	3-1-0	4
2	20AD5M01	Fundamentals of Data Science and Analytics	3-1-0	4
3	20AD6M01	Applications of AI in Data Science	3-1-0	4
4	20AD7M01	Machine Learning with Python	3-1-0	4
5	20AD8M01	Data Visualization with Power BI	3-1-0	4

I SEMESTER	L	T	P	C
	3	-	-	3
20MA1T01 :: LINEAR ALGEBRA				

COURSE OBJECTIVES:

1. This course will illuminate the students in the concepts of calculus and linear algebra.
2. This course equips the students with standard concepts and tools an intermediate level to advanced level and to develop the confidence; ability to handle various real world problems and their applications.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Develop the use of matrix algebra techniques that is needed by engineers for practical applications (K3)

CO2: Familiarize with functions of several variables which is useful in optimization (K3)

CO3: Learn important tools of calculus in higher dimensions. Students will become familiar with double integral(K3)

CO4: Familiarize with triple integral and also learn the utilization of special functions. (K4).

CO5: Apply double integration techniques in evaluating areas bounded by a region.(K4)

Bridge Course: Limits, continuity, Types of matrices

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by Echelon form, Normal form - solving system of homogeneous and non-homogeneous linear equations- Gauss Elimination, Jacobi and Gauss Seidel methods

Learning Outcomes:

At the end of this unit, the student will be able to

- solve system of linear equations. (K2)
- determine the rank of a matrix. (K2)

Unit II: Eigen values and Eigen vectors

Eigen values and Eigen vectors - and their properties (without proof). Cayley-Hamilton theorem (without proof), Finding inverse and powers of a matrix by Cayley-Hamilton theorem - Reduction of a matrix to diagonal form.

Learning Outcomes:

At the end of this unit, the student will be able to

- find eigen values and eigen vectors of a matrix. (K2)
- find inverse and powers of a matrix by Cayley-Hamilton theorem.(K2)

Unit III: Quadratic forms

Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- reduce a matrix to diagonal form and identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (K3)

Unit IV: Multivariable calculus

Expansions of functions: Taylor's and Maclaurin's series - Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- expand the given function as Taylor's and Maclaurin's series. (K3)
- find partial derivatives numerically and symbolically and use them to analyze and interpret the way in which a function varies. (K3)
- acquire the knowledge in maxima and minima of functions of several variables (K1)
- utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (K3)

Unit V: Multiple Integrals

Double Integrals: Change of order of integration, double integrals in polar coordinates, areas enclosed by plane curves.

Triple Integrals: Evaluation of triple integrals, change of variables.

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates.(K3)
- apply double integration techniques in evaluating areas bounded by a region.(K4)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43/e, Khanna Publishers, 2015.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

I SEMESTER	L	T	P	C
	3	-	3	3
20BS1T01 :: ENGINEERING PHYSICS				

COURSE OUTCOMES

After completion of course student able to:

CO1: Describe Basic crystal systems and determination of crystal structures
CO2: Explain Magnetic and Dielectric Materials properties
CO3: Describe Concept of Magnetic Induction and Super Conducting properties
CO4: Explain Pure & Doped Semiconductor materials for better utility
CO5: Describe Optical fibers and Optical properties of materials and their applications

SYLLABUS

UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION

CRYSTAL STRUCTURE:

Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

X-RAY DIFFRACTION:

Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg's law-Bragg's Spectrometer.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the seven crystal systems
- **Interpret** the crystal structure based on Bragg's law

UNIT – II: MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Introduction-Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis- soft and Hard Magnetic materials.

DIELECTRIC PROPERTIES: Introduction-Dielectric constant- Relation between three electric vectors- Electronic and ionic polarizations (Quantitative) - orientation polarization (Qualitative) - Internal fields in solids- Clausius - Mossotti equation.

Learning Outcomes: At the end of this unit, the students will be able to

- **Classify** the magnetic materials into dia, para, ferro, anti ferro and ferri
- **Explain** the importance of hysteresis
- **Explain** the concept of polarization in dielectric materials.
- **Summarize** various types of polarization of dielectrics .
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.

UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY

ELECTROMAGNETIC WAVES: Introduction-Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere's law - B for a Solenoid - Biot-Savart's law-Magnetic Induction due to current carrying circular loop- Faraday's law - Maxwell's equations (Integral and differential forms).

SUPERCONDUCTIVITY: General and Thermal properties –Meissner effect – Type-I and Type-II superconductors – Flux quantization – BCS Theory of Superconductivity - Josephson effects – Applications of Superconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Illustrate** the concept of electro magnetism based on fundamental laws of electro magnetism
- **Explain** Maxwell's equations
- **Summarize** various properties and applications of superconductors

UNIT-IV: PHYSICS OF SEMICONDUCTORS:

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers- Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers- Drift and diffusion – Einstein's equation – Hall Effect- Hall coefficient – Applications of Hall effect– direct & indirect band gap semiconductors.

Learning Outcomes: At the end of this unit, the students will be able to

- **Summarize** various types of solids based on band theory.
- **Outline** the properties of n-type and p-type semiconductors.
- **Identify** the type of semiconductor using Hall effect

UNIT-V: LASERS AND OPTICAL FIBERS

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

FIBER OPTICS: Introduction to Optical fibers- Critical angle of propagation- Total internal reflection- Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Attenuation in optical fibers - Applications of optical fibers.

Learning Outcomes: At the end of this unit, the students will be able to

- **Design** various types of lasers
- **Explain** the principle and propagation of light through Optical fibers
- **Discuss** the application of lasers and Optical fibers

I SEMESTER	L	T	P	C
	3	-	-	3
20HS1T01 :: ENGLISH				

A. PROGRAMME CONTENT

1 Intensive and extensive reading
2 Written communication
3 Listening and oral communication
4 Vocabulary consolidation and expansion
5 Practicing grammar

B. **ELABORATION OF THE PROGRAMME CONTENT**

1. Intensive and Extensive Reading

a. Identifying the main theme/the central idea of a passage
b. Understanding the meaning of words, phrases and sentences in context
c. Understanding the logical relationship between sentences (through recognition of grammatical structures such as linkers and connectors)
d. Distinguishing statements of fact from beliefs, opinions, hypotheses, and expressions of probability and certainty
e. Inferring facts, opinions, instances, reasons, causes, results, requests, conclusions, and general statements
f. Skimming passages to identify general ideas and information
g. Scanning passages to locate specific detail
h. The use of one's knowledge, opinions, and imagination to provide information / situations related to that given in the text; and comparison and contrast.

2. Written Communication

a. Writing outlines and summaries
b. Writing paragraphs with attention to topic sentences and supporting sentences
c. Writing paragraphs with attention to coherence and cohesion
d. Practicing clutter-free writing

3. Listening and Oral Communication

a. Effective listening involving
- Identification of key words and phrases and specific information, application of one's previous knowledge of to understand the ideas dealt with in the text being listened to.
- Attention to communication strategies such as approaching another person and opening a conversation with him/her, making friends with a stranger, thanking, apologizing, paying a compliment, seeking clarification, making enquiries, and creating an appropriate context for a formal discussion.

b. Taking part in speaking activities for interactional purposes such as,
- Introducing oneself to others, introducing others, making enquiries, seeking information
- Responding to enquiries, supplying information
- Expressing agreement/disagreement in information situations

c. Taking part in speaking activities for transactional purposes with attention to the communication strategies listed in 1 (a) above.

4. Vocabulary consolidation and expansion

a. Inferring word meaning from available clues
b. Distinguishing words with similar meanings
c. Using connecting words
d. Learning one-word substitutes

Developing a verbal repertoire with the following dimensions:
- Contexts of use
- Collocations

- Differences in speaking and writing
- Strategic use

e. Using strategic vocabulary to organize and manage both oral and written communication successfully in academic, professional, and social contexts

f. Raising one's knowledge of redundancy, circumlocution, and imprecise and confusing expressions in order to avoid them in one's own speech and writing.

5. Practicing grammar

a. Consolidation as well as remediation in the following areas:

Parts of speech, Tenses and usage of grammar in context

b. Learning to avoid some of the common pitfalls in the area of grammar in Indian usage of English (e.g. using the present continuous tense to describe actions which happen regularly; using state verbs in the continuous form; tense mixing)

C. TEXT BOOK: Building Effective Communication Skills

By Maruthi Publications (2019)

Syllabus :

U No	Content
UNIT –I	**Vocabulary Building** **1.1** Video Lesson 1.2.1 Word formation 1.2.2. Root words 1.2.3. Prefixes and Suffixes 1.2.4. Synonyms and Antonyms **1.3 Parts of Speech** **1.4 Note- making, Note-taking**
UNIT -II	**Basic Writing Skills** **2.1** Video Lesson 2.2.1 Basic sentence structure 2.2.2. Clauses and Phrases 2.2.3 Punctuations 2.2.4 Creating coherence 2.2.5 Organizing principles of paragraph documents 2.2.6 Techniques for writing precisely **2.3 Tenses** **2.4 Letter Writing**
UNIT-III	**Identifying Common Errors in Writing** **3.1** Video Lesson 3.2.1 Sub + verb agreement 3.2.2 Noun pronoun agreement 3.2.3 Articles 3.2.4 Preposition 3.2.5 Redundancies 3.2.6 Clichés **3.3.1 Active - Passive Voice** **3.3.2 Reported Speech** **3.4 Resume Writing**
UNIT-IV	**Nature and Style of sensible Writing** **4.1** Video Lesson 4.2.1 Describing 4.2.2 Classifying 4.2.3 Writing Introduction and conclusion **4.3.1 Conditional Sentences** **4.3.2 Degrees of Comparison** **4.4 Email writing**
UNIT-V	**Writing Practice** **5.1** Video Lesson 5.2.1 Comprehension 5.2.2 Precise writing 5.2.3 Essay Writing **5.3 Simple Compound and Complex Sentences** **5.4 Report Writing**

I SEMESTER	L	T	P	C
	3	-	-	3
20CS1T01 :: PROBLEM SOLVING USING C PROGRAMMING				

COURSE OUTCOMES:

At the end of the course, student will be able to

CO1: Analyse a computational problem and develop an algorithm/flowchart to find its solution **(K2)**

CO2: Develop C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or bitwise operators **(K3)**

CO3: Divide a given computational problem into a number of modules and develop C program with arrays(K3)

CO4: Write C programs which use pointers for array processing and parameter passing **(K3)**

CO5: Develop C programs with structure or union and files for storing the data to be processed. **(K3)**

UNIT-I **Contact Hours : 10**

INTRODUCTION TO PROGRAMMING : What is computer, Block diagram of Computer, Development of Computer languages, Translators, Computer Codes, Computer Arithmetic, Programming Techniques, Algorithm, Flowchart

BASICS OF C : History of C, Character Set, Identifiers, Keywords, Tokens, Variables, constants, operators, Data types, expressions, expression evaluation, operator precedence and associativity, typecasting C program structure.

UNIT-II **Contact Hours : 8**

CONSOLE I/O OPERATIONS : Formatted I/O - printf & scanf, Unformatted I/O functions.

CONTROL FLOW STATEMENTS: Branching Statements - if, if – else, switch. **Looping statements-** while, do – while, for, nested for. **Unconditional Statements -** break, continue, goto, exit.

UNIT-III **Contact Hours : 12**

ARRAYS : Array declaration , initialization and Accessing, Types of Arrays : 1-D and 2-D Arrays, Arrays as Function Arguments

FUNCTIONS: Introduction to Functions, Types of Function, Function prototypes, parameter passing techniques, Scope of variables, Storage classes, Recursion

UNIT-IV **Contact Hours : 8**

STRINGS: Reading String from terminal, Writing string to Screen, String Handling Functions.

POINTERS: Pointer Declaration, Initialization and Accessing , Types of Pointers, Pointer Arithmetic, Dynamic memory allocation

UNIT-V **Contact Hours : 10**

STRUCTURE : Introduction to structures, Definition of structure , declaration of structure variable, accessing of structure members, array of structures, **Union, enum, bit fileds, typedef**

FILES : Introduction to Files, Types of File, File Modes, Writing and Reading Files, File management I/O functions.

Text books:

- Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill
- Programming With C, Schaum Series

Reference Books:

- The 'C' programming language by Kernighan and Ritchie, Prentice Hall
- Computer Programming in 'C' by V. Rajaraman , Prentice Hall
- Programming and Problem Solving by M. Sprankle, Pearson Education
- How to solve it by Computer by R.G. Dromey, Pearson Education

Online Practice and Reference Material

http://www2.its.strath.ac.uk/courses/c/
http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.html
http://www.stat.cmu.edu/~hseltman/Computer.html
http://projecteuler.net/

I SEMESTER	L	T	P	C
	-	-	3	1.5
20BS1L01 :: ENGINEERING PHYSICS LAB				

COURSE OUTCOMES

At the end of the course, student will be able to

CO1: Demonstrate the basic knowledge to know the frequency of a vibrator, hall coefficient, (K3)

CO2: Attain knowledge to verify some of the properties of physical optics. (K4)

CO3: Develop skills to plot various characteristic curves and to calculate the physical properties of given materials. (K4)

CO4: Calculate some the properties of semiconducting materials. (K2)

CO5: Determine the time constant for a C-R circuit, measure Planck's constant using a photo-cell, and determine the dielectric constant of a given material, showcasing a strong understanding of experimental methodologies and data analysis techniques.

STUDENT HAS TO DO ANY TEN OF THE FOLLOWING

1. Determination of wavelength of Laser using diffraction grating.
2. Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.
3. Determination of the charge carrier density by using Hall Effect.
4. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
5. Study of Characteristic curves (l/V) of a Zener diode to determine its Breakdown voltage.
6. Determination of Temperature coefficient of resistance of a Thermistor by using its Characteristic curve.
7. Study the variation of intensity of magnetic field along the axis of a circular current carrying coil by using Stewart and Gee's experiment.
8. Study of Characteristic curves (l/V) of a P-N diode.
9. Determine Frequency of given electrically driven tuning fork in Transverse and Longitudinal modes by using Melde's apparatus
10. Determine frequency of A.C. supply by using Sonometer.
11. Determination of the Time Constant for a C-R Circuit
12. Determination of the Planck's constant by using Photo-Cell
13. Determination of dielectric constant of a given material

I SEMESTER	L	T	P	C
	-	-	3	1.5
20HS1L01 :: ENGLISH PROFICIENCY LAB				

COURSE OBJECTIVES

1. To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. To assist students to carry on the tasks and activities through guided instructions and materials.
4. To effectively integrate English language learning with employability skills and training.
5. To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
6. To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) Reading Skills.
- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:
- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:
- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:
- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

RELATIONSHIP OF COURSE TO PROGRAMME OUTCOMES

A	Ability to apply knowledge of mathematics, science, and engineering.	
B	Ability to design and conduct experiments, as well as to analyze and interpret data.	
C	Ability to design an Engineering system, component, or process.	
D	Ability to function on multi-disciplinary teams	
E	Ability to identify, formulate and solve engineering problems.	

F	Understanding of professional and ethical responsibility.	
G	Ability to communicate effectively	√
H	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	√
I	Recognition of the need for and an ability to engage in life-long learning.	
J	Knowledge of contemporary issues.	
K	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.	
L	Ability to find location of substations and benefits derived through their optimal location.	

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus:

Unit	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:

"InfoTech English" by Maruthi Publications

Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

Testing Pattern:

A) Internal lab Exam: **30 Marks**

Regular performance in the language /communication /lab completion in the lab manual 15M

Written test 15M

B) External lab Exam Pattern: **70 Marks**

Written test 30M

Oral test 30M

Viva (during exam marks will be awarded by external examiner) 10M

I SEMESTER	L	T	P	C
	-	-	3	1.5
20CS1L01 :: C PROGRAMMING LAB				

COURSE OBJECTIVES:

1. To impart knowledge on various Editors, Raptor.
2. To make the students understand the concepts of C programming.
3. To nurture the students on Control Structures and develop different operations on arrays
4. To make use of String fundamentals and modular programming constructs.
5. To implement programs using dynamic memory allocation.
6. To explain the concepts of Structure, Unions and files for solving various problems.

COURSE OUTCOMES:

CO1: Implement basic programs in C and design flowcharts in Raptor.
CO2: Use Conditional and Iterative statements to solve real time scenarios in C.
CO3: Implement the concept of Arrays and Modularity and Strings.
CO4: Apply the Dynamic Memory Allocation functions using pointers.
CO5: Develop programs using structures, and Files.

LIST OF EXPERIMENTS:

1. Introduction to Algorithms and Flowcharts

1.1) Implement Algorithm Development for Exchange the values of Two numbers.

1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.

1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

2.1) Exposure to Turbo C, Code Blocks IDE, Dev C++, Falcon C++.

2.2) Writing simple programs using printf(), scanf() .

3. Raptor

3.1) Introduction to Raptor.

3.2) Draw a flow chart to find the Sum of 2 numbers.

3.3) Draw a flow chart to find Simple interest.

4. Basic Math

4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.

4.2) Write a C Program to find largest of three numbers using ternary operator.

4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.

5.2) Write a C program to find the roots of a Quadratic Equation.

5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch…case.

6. Control Flow- II

6.1) Write a C Program to Find Whether the Given Number is Prime number or not.

6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.

6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

7.1) Write a C program to find the sum of individual digits of a positive integer.

7.2) Write a C program to check whether given number is palindrome or not.

7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$.

Practice Programs:

1. Write a C program to print all natural numbers from 1 to n. - using while loop
2. Write a C program to print all natural numbers in reverse (from n to 1). - using while loop
3. Write a C program to print all alphabets from a to z. - using while loop
4. Write a C program to print all even numbers between 1 to 100. - using while loop
5. Write a C program to print sum of all even numbers between 1 to n.
6. Write a C program to print sum of all odd numbers between 1 to n.
7. Write a C program to print table of any number.
8. Write a C program to find first and last digit of any number.
9. Write a C program to count number of digits in any number.
10. Write a C program to calculate sum of digits of any number.
11. Write a C program to calculate product of digits of any number.
12. Write a C program to swap first and last digits of any number.
13. Write a C program to enter any number and print its reverse.
14. Write a C program to enter any number and check whether the number is palindrome or not.
15. Write a C program to find frequency of each digit in a given integer.
16. Write a C program to enter any number and print it in words.
17. Write a C program to print all ASCII character with their values.
18. Write a C program to enter any number and print all factors of the number.
19. Write a C program to enter any number and calculate its factorial.
20. Write a C program to find HCF (GCD) of two numbers.
21. Write a C program to find LCM of two numbers.
22. Write a C program to check whether a number is Prime number or not.
23. Write a C program to check whether a number is Armstrong number or not.
24. Write a C program to check whether a number is Perfect number or not.
25. Write a C program to check whether a number is Strong number or not.
26. Write a C program to print Fibonacci series up to n terms.

8. Arrays

8.1) Write a C program to search an element in the given array (Linear Search).

8.2) Write a C program to perform matrix addition.

8.3) Write a C program to perform matrix multiplication.

Practice Programs:

1. Write a C program to read and print elements of array.
2. Write a C program to find sum of all array elements. - using recursion.
3. Write a C program to find maximum and minimum element in an array. - using recursion.
4. Write a C program to find second largest element in an array.
5. Write a C program to copy all elements from an array to another array.
6. Write a C program to insert an element in an array.
7. Write a C program to delete an element from an array at specified position.
8. Write a C program to print all unique elements in the array.

9. Write a C program to print all negative elements in an array.
10. Write a C program to count total number of even and odd elements in an array.
11. Write a C program to count total number of negative elements in an array.
12. Write a C program to count total number of duplicate elements in an array.
13. Write a C program to delete all duplicate elements from an array.
14. Write a C program to count frequency of each element in an array.
15. Write a C program to merge two array to third array.
16. Write a C program to find reverse of an array.
17. Write a C program to convert lowercase string to uppercase.
18. Write a C program to convert uppercase string to lowercase.
19. Write a C program to toggle case of each character of a string.
20. Write a C program to find total number of alphabets, digits or special character in a string.

9. Pointers

9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.

9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

10.1) Write a C Program to demonstrate parameter passing in Functions.

10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.

10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

Practice Programs:

1. Program to change the value of constant integer using pointers.
2. Program to print a string using pointer.
3. Program to count vowels and consonants in a string using pointer.
4. Program to read array elements and print with addresses.

11. Strings

11.1) Implementation of string manipulation operations with library function:

a) copy
b) concatenate
c) length
d) compare

11.2) Implementation of string manipulation operations without library function:

a) copy
b) concatenate
c) length
d) compare

11.3) Verify whether the given string is a palindrome or not.

12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.

12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.

13.2) Write a C program to copy content of one file to another file.

13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Reference Books:

1. Let Us C Yashwanth Kanetkar, 16th edition, BPB Publications.
2. Programming in C A-Practial Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
4. Problem solving using C , K Venugopal,3rd Edition,TMG Publication.

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

I SEMESTER	L	T	P	C
	-	-	3	1.5
20IT1L01 : : IT WORKSHOP				

COURSE OBJECTIVES:

1. The course focuses on enhancing student knowledge in computer peripherals and assembling.
2. To install operating system on computers and create new email account.
3. To understand basic software like WinRAR, WinZip, PDF readers and web browser.
4. To provide technical training to the students on Google tools like forms, calendar, drive, and classroom.

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to

CO1: Attain complete knowledge of a computer hardware
CO2: Able to install basic computer engineering software.
CO3: Able to do document task through MS office.
CO4: Attain technically strong usage of Google Tools and Email handling.
CO5: Able to understand network troubleshooting.

LIST OF EXPERIMENTS

1. Components of Computer & Assembling a Computer:
Learning about the different parts of the computer and its advancement

- Processor
- Memory – Types
- Motherboard
- Peripheral interfaces – I/O devices

2. Components of Computer & Assembling a Computer:

- Learn about the proper connectivity among the devices inside the PC
- Assembling the different parts of the computer inside the cabinet

3. Productivity Tools - Learning Basic Software:

- Installation of Productivity tools like WinRAR, WinZip, and PDF Reader.
- Installation of Application programs like Microsoft Office, Image Editor and Web browsers.
- Connect the Printer and Scanner Devices perform printing and scanning operation.

4. Productivity Tools:Microsoft-Word orientation – To create project certificate, Formatting Fonts, Drop Cap, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option.

5. Productivity Tools:Microsoft-Word orientation- Mail Merge, Macros, References.

6. Productivity Tools:Microsoft-PowerPoint utilities - PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks, Inserting Images, Clip Art, Audio, Video, Objects, Tables and Charts.

7. Productivity Tools:Microsoft-Excel orientation - Gridlines, Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel – average, std.deviation etc., Macros.

8. Productivity Tools:Microsoft-Excel orientation- Charts, Hyper linking, Split cells, freeze panes, group andoutline, Conditional formatting, Sort and Filter, .csv file.

9. Introduction to Google Tools:
- Design a Google form and collect a response data among students using Google Form.
- Schedule one day of your activities using Google Calendar.
- Store and retrieve data from cloud storage using Google Drive.
- Orientation towards Google Classroom.

10. Network basics: Introduction, Types of networks, IP addressing, LAN, Network troubleshooting.

II SEMESTER	L	T	P	C
	3	-	-	3
20MA2T02 :: DIFFERENTIAL EQUATIONS AND NUMERICAL METHODS				

COURSE OBJECTIVES:

1. To enlighten the learners in the concept of differential equations.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

COURSE OUTCOMES:

At the end of the course, the student will be able to

CO1: Solve the differential equations related to various engineering fields (K3)

CO2: Identify solution methods of partial differential equations that model physical processes (K3)

CO3: Evaluate the approximate roots of polynomial and transcendental equations by different algorithms(K3)

CO4: Solve integrate and ordinary differential equations by various numerical techniques.(K3)

CO5: Solve ordinary differential equations by using different numerical schemes (K3).

Unit- I: Linear differential equations of higher order:

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method of Variation of parameters.

Learning Outcomes:

At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients (K3)
- solve the linear differential equations with constant coefficients by appropriate method (K3)

Unit –II: Partial Differential Equations of First Order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equations and nonlinear (standard types) equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs (K3)
- outline the basic properties of standard PDEs (K2)

Unit -III: Interpolation

Finite differences, Differences of a polynomial, relation between operators, to find one or more missing terms, Newton's interpolation formulae, and interpolation with unequal intervals- Lagrange's formula.

Learning Outcomes:

After the completion of this unit student will be able to

- explain various discrete operators and find the relation among operators (K2)
- apply Newton's forward and backward formulas for equal and unequal intervals (K3)

Unit -IV: Numerical Solution of Equations and Numerical integration

Numerical Solution of Equations: Solution of algebraic and transcendental equations - Bisection Method, Method of False Position, Newton-Raphson Method, useful deduction from Newton-Raphson Method.

Numerical Integration – Trapezoidal rule, Simpson's $\frac{1}{3}$ rule and Simpson's $\frac{3}{8}$ rule.

Learning Outcomes:

After the completion of this unit student will be able to

- find approximate roots of an equation by using different numerical methods (K3)
- find integral of a function by using different numerical methods (K3)

Unit -V: Numerical Methods to Solve Ordinary Differential Equations

Numerical Methods to Solve Ordinary Differential Equations - Taylor's series, Euler's and modified Euler's methods, Runge-kutta method of fourth order for solving first order equations.

Learning Outcomes:

After the completion of this unit student will be able to

- solve ordinary differential equations by using different numerical schemes (K3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 43/e, Khanna publishers,2015.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

II SEMESTER	L	T	P	C
	3	-	-	3
20BS2T02 :: ENGINEERING CHEMISTRY				

COURSE OUTCOMES

At the end of semester, the students will be able to

CO1: Explain the impurities present in raw water, problems associated and how to avoid them (K2)

CO2: Explain the advantages of Polymers in daily life (K2)

CO3: Explain the theory of construction of battery and fuel cells and theories of corrosion and prevention methods. (K2)

CO4: Differentiate conventional and non-conventional energy sources and their advantages and disadvantages. (K2)

CO5: Identify the usage of advanced materials in day to day life (K2)

UNIT- I: WATER TECHNOLOGY [9 Hours]

Part-A

Hard water-Types of hardness-Units of Hard Water-Disadvantages of hard water-Determination of hardness by EDTA complexometric method.

Portable water- its specifications-steps involved in purification of water (Sedimentation, Filtration, Disinfection)-chlorination, break point of chlorination.

Boiler Feed Water-Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Part-B

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.

Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

Learning Outcomes: At the end of this unit, the students will be able to Explain

The impurities present in raw water, problems associated with them and how to avoid them

UNIT-II: POLYMERS AND COMPOSITE MATERIALS [9 Hours]

Part-A

Polymers-degree of polymerization-functionality-preparation, properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

Plastics: Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process. (Injection moulding, Compression moulding, Extrusion moulding, Transfer moulding)

Part-B

Rubbers and elastomers: Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

Composite materials: Fiber reinforced plastics-biodegradable polymers-biomedical polymers, Recycling of e-waste.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the properties of polymers and various additives added and different methods of forming plastic materials.
- **Explain** the preparation, properties and applications of some plastic materials.
- **Discuss** natural and synthetic rubbers and their applications.

UNIT -III: ELECTRO CHEMICAL CELLS AND CORROSION [12 Hours]

Electrochemical Cells: Introduction–single electrode potential - electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode. Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid and Li-ion) battery. Fuel cells (H_2-O_2, Methanol-Air cells).

Corrosion: Cause and consequences of corrosion-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere. Corrosion Prevention methods: Cathodic protection-Sacrificial anodic method-Impressed voltage method. Metallic coatings: Galvanization-Tinning-Electro plating-Electro less plating.

Learning Outcomes: At the end of this unit, the students will be able to

- **Explain** the theory of construction of battery and fuel cells.
- **Categorize** the reasons for corrosion and study some methods of corrosion control.

UNIT -IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES [9 Hours]

Conventional energy sources: Classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking – petrol and diesel knocking – octane number and cetane number – gaseous fuels – Natural gas – CNG - LPG

Non-conventional energy sources: Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell -Introduction to hydro power-geo thermal power-tidal and wave power.

Learning Outcomes: At the end of this unit, the students will be able to

1. **Differentiate** conventional and non-conventional energy sources and their advantages and disadvantages.
2. **design** sources of energy by different natural sources

UNIT -V: CHEMISTRY OF MATERIALS [9 Hours]

Part-A

Nano materials: Introduction-sol-gel method-characterization by SEM and TEM methods- carbon nanotubes and fullerenes: Types, preparation and applications

Semiconductors: Preparation (Distillation, Zone refining)

Part-B

Cement: Constituents of cement -Setting and Hardening of cement - Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the awareness of materials like nanomaterials and fullerenes and their uses.
- **Explain** the techniques that detect and measure the surface properties of materials.
- **Illustrate** the commonly used industrial materials.

Text Books:

T1. A Text Book of Engineering Chemistry - N. Y. S. Murthy, V. Anuradha & K. Ramana Rao, Maruthi Publications. (2018)

T2. A Text Book of Engineering Chemistry - K. Sesha Maheswaramma, Mridula Chugh, Pearson Publications (2018).

Reference Books:

R1. Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company (Latest Edition)

R2. Text Book of Engineering Chemistry - Shashi Chawla, Dhanpat Rai & Co. (P) Limited ((Latest Edition))

R3. Chemistry –Prasanta Rath, Subhendu Chakroborthy, Cengage publications (2018)

II SEMESTER	L	T	P	C
	3	-	-	3
20CS2T03 :: OBJECT ORIENTED PROGRAMMING WITH PYTHON				

COURSE OBJECTIVES:

1. Acquire programming skills in core Python.
2. Acquire Object-Oriented Programming features implementation in Python.
3. To understand data structures in Python
4. Develop the ability to use Operating System functions in python applications
5. Able to use exception handling in python programs

COURSE OUTCOMES:

CO1: Recognize core programming basics and program design with functions using Python programming language.
CO2: Interpret the high-performance programs designed to strengthen the practical expertise.
CO3: Develop applications for real time problems by applying python data structure concepts.
CO4: Understand and apply the concepts of packages, handling, multithreading and socket programming.
CO5: Analyze the importance of object-oriented programming over structured programming.

UNIT – I:

Introduction to Python: Features of Python, 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.
Data types: Integers, Strings, Booleans.

UNIT – II:

Operators and Expressions: Types - Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations
Control Flow: if, if-elif-else, for, while, break, continue, pass

UNIT – III:

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.
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.

UNIT – IV:

Object Oriented Programming in Python: Classes, Data hiding, 'self-variable', Methods, Constructor, methods, and inheritance: Various Types of Inheritance and Function Overloading, Overriding Methods.

UNIT – V:

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions
Brief Tour of the Standard Library: Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times

Text Books:

1. Learning Python, Mark Lutz, Orielly
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. R Nageswara Rao, "Core Python Programming", Dream tech press, 2017 Edition
4. Dusty Philips, "Python 3 Object Oriented Programming", PACKT Publishing, 2nd Edition, 2015

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Michael H.Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.

Web References:

1. https://realpython.com/python3-object-oriented-programming/
2. https://python.swaroopch.com/oop.html
3. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
4. https://www.programiz.com/python-programming

II SEMESTER	L	T	P	C
	3	-	-	3
20IT2T01 :: IT ESSENTIALS				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Understand the concepts of operating systems.
CO2: Demonstrate the implementation of various software engineering tools.
CO3: Understand the basics of Internet.
CO4: Understand the orientation towards web basics.
CO5: Demonstrate the implementation of various computer graphics concepts.

UNIT-1

Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, Installation of Operating Systems, The Unix Operating System, Basic Unix commands.

UNIT-2

Software Engineering: The evolving role of software, changing nature of software, software myths, Structure of Software Life Cycle, Software engineering methodologies, software requirements, various software engineering tools.

UNIT-3

Internet Basics: Introduction, Features of Internet, Internet applications, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System, Security- Forms of attacks, legal approaches to network security.

UNIT-4

Web Basics: Introduction to web, web browsers, web servers, Protocol, HTTP/HTTPS, TCP/IP, Email, FTP, SMTP, SNMP, URL, HTML and CSS.

UNIT-5

Computer Graphics: Scope of Computer Graphics, Overview of 3D Graphics, Modelling- modelling individual objects, modelling entire scenes. Dealing with global lighting - Ray tracing, Radiosity. Rendering and Animation.

TEXT BOOKS

1. J. Glenn Brookshear, "Computer Science: An Overview", Addision-Wesley, TwelfthEdition, 2014.
2. Pradeep K Simha, "Computer Fundamentals- Concepts, Systems & Applications", 8th edition, BPB.

II SEMESTER	L	T	P	C
	3	-	-	3
20EE2T01 :: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Analyze different electrical networks using KVL, KCL and Theorems.

CO2: Understand the basic concepts of single-phase system for simple AC circuit.

CO3: Demonstrate the construction, working and operating characteristics of AC & DC machines.

CO4: Study the construction details, operation and characteristics of various semiconductor devices, digital and logic operations.

CO5: Apply concepts of binary number system, logic gates, Boolean algebra, De Morgan's theorem, Boolean expression simplification, half and full adders, and A/D and D/A conversions in digital electronics.

UNIT-I: ELECTRICAL CIRCUITS

Basic definitions – types of network elements Electrical Circuit Elements (R, L and C), Voltage and Current Sources, Ohms Laws, Kirchoff's Laws and Star/Delta Conversion, Series-Parallel- Series and Parallel (Only Resistor), Superposition, Thevenin's and Norton's Theorems, Problems in Simple Circuits with DC Excitation

UNIT-II: AC FUNDAMENTALS

Representation of Sinusoidal Waveforms, Peak and RMS Values. Real Power, Reactive Power, Apparent Power, Power Factor. Concept of phase angle and phase difference Single phase Circuits - Voltage and Current Relations in Star/Delta Connections-Simple Problems.

UNIT-III:ELECTRICAL MACHINES

Electrical Machines: DC Machines: Classification of DC Machines-DC Generator and Motor Construction-Principle of operation –EMF Equation-Performance Characteristics-Simple problems AC Machines: Classification of AC Machines-Transformers-Synchronous Machines, Induction motor Performance Characteristics-Starting Methods-Simple problems.

UNIT- IV:SEMI -CONDUCTOR DEVICES AND ITS CHARACTERISTICS

Characteristics of PN Junction Diode — Zener Diode- Intrinsic and Extrinsic Semiconductors – Semiconductor Diodes– Bipolar Junction Transistors-CB, CE, CC Configurations and Characteristics – FET – MOSFET – Silicon-controlled Rectifier – DIAC – TRIAC-Half waveand Full wave Rectifiers- Voltage Regulation.

UNIT-V: INTRODUCTION TO DIGITAL ELECTRONICS

Binary Number System – Logic Gates – Boolean Algebra -De Morgan's Theorem-Simplification of Boolean Expressions using De Morgan's Theorem – Half and Full Adders – A/D and D/A Conversion.

TEXT BOOKS:

1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. Basic Electrical Engineering, P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, Cengage, 2019.
3. Basic Electrical & Electronics Engineering – J. B. Gupta, S. K. Kataria & Sons Publications, 2019 edition.

REFERENCE BOOKS:

1. Basic Electrical Engineering - D.C. Kulshreshtha, 2009, Tata McGraw Hill.
2. Fundamentals of Electrical Engineering, L.S. Bobrow, Oxford University Press, 2011
3. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
4. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.
5. Principles of Electrical Engineering and Electronics", V K Mehta & Rohit Mehta,S Chand Publishers,2019 edition.

II SEMESTER	L	T	P	C
	-	-	3	1.5
20CS2L03 :: OBJECT ORIENTED PROGRAMMING LAB WITH PYTHON				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Apply core programming basics and program design with functions using Python programming language.

CO2: Interpret the high-performance programs designed to strengthen the practical expertise.

CO3: Develop applications for real time problems by applying python data structure concepts.

CO4: Test and apply the concepts of packages, handling, multithreading and socket programming.

CO5: Divide the importance of object-oriented programming over structured programming.

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user.

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . .1/10

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

a) Write a program combine lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

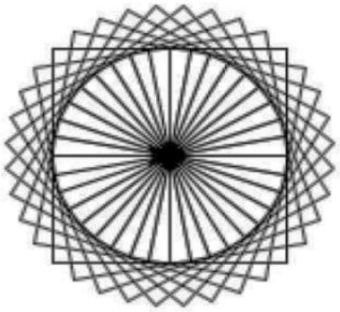
a) Install packages requests, flask and explore them. using (pip)
b) Write a script that imports requests and fetch content from the page.
c) Write a simple script that serves a simple HTTP Response and a simple HTML Page

Exercise - 13 OOP

a) Class variables and instance variable and illustration of the self-variable
i) Robot ii) ATM Machine

Exercise - 14 GUI, Graphics

a) Write a GUI for an Expression Calculator using tk
Write a program to implement the following figures using turtle



Text Books:

1. Learning Python, Mark Lutz, Orielly
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. R Nageswara Rao, "Core Python Programming", Dream tech press, 2017 Edition
4. Dusty Philips, "Python 3 Object Oriented Programming", PACKT Publishing, 2nd Edition, 2015

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3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Michael H.Goldwasser, David Letscher, "Object Oriented Programming in Python", Prentice Hall, 1st Edition, 2007.

Web References:

1. https://realpython.com/python3-object-oriented-programming/
2. https://python.swaroopch.com/oop.html
3. https://python-textbok.readthedocs.io/en/1.0/Object_Oriented_Programming.html
4. https://www.programiz.com/python-programming

II SEMESTER	L	T	P	C
	-	-	3	1.5
20EE2L01 :: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB				

COURSE OUTCOMES:

After successful completion of this course, students should be able to:

CO1: Acquire knowledge on electrical networks by using KVL,KCL.

CO2: Analyze the performance characteristics and to determine efficiency of DC machines.

CO3: Understand the characteristics of AC machines.

CO4: Apply knowledge on PN junction diode , transistor and Rectifiers

CO5: Analyze, and design half-wave and full-wave rectifiers with and without filters, considering their applications and performance characteristics in AC to DC signal conversion.

LIST OF EXPERIMENTS

SECTION A: ELECTRICAL ENGINEERING:

1. Verification of KCL & KVL.
2. Open circuit Characteristics of DC Shunt generator.
3. Swinburne's test on DC Shunt Motor.
4. Brake test on DC Shunt motor.
5. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
6. Open circuit and Short circuit test on a Single Phase Transformers.
7. Draw the Torque-Slip Characteristic of a Three Phase Induction Motor.
8. Regulation of Synchronous Machine using EMF Method.

SECTION B: ELECTRONICS ENGINEERING:

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and Resistance calculations)
2. Transistor CE characteristics (input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.

Any 10 Experiments has to be conducted from Section A & B

Reference Books:

1. Department lab manual.

II SEMESTER	L	T	P	C
	-	-	3	1.5
20BS2L02 :: ENGINEERING CHEMISTRY LAB				

OUTCOMES: The experiments introduce volumetric analysis: Acid-Base, complexometric, Redox, Conductometric and potentiometric titrations. Then they are exposed to a few instrumental methods of chemical analysis.

COURSE OUTCOMES:

Thus at the end of the lab course, the student is exposed and able to

CO1: Identify the concentration of given solution by different methods of chemical analysis (**K3**)

CO2: Analyze the water purity by checking hardness, DO and Acidity. (**K4**)

CO3: Estimate the Cu^{+2}, Fe^{+3}, Ca^{+2}, Mg^{+2} ions and Ascorbic acid present in given solution. (**K4**)

CO4: Identify the pour and cloud point of lubricants. **(K3)**

CO5: Understand the principles of conductometric and potentiometric titrations. (**K2**)

LIST OF EXPERIMENTS:

1. Estimation of HCl using standard Na_2CO_3 through acid-base titration.
2. Estimate the total hardness of water using standardized EDTA solution through complexometric titration.
3. Estimation of $KMnO_4$ using standard $H_2C_2O_4$ through redox titration method.
4. Estimation of Dissolved Oxygen in given water sample by Wrinkler's Method
5. Determination of Ferric (Fe^{+3}) ions using standard $K_2Cr_2O_7$ solution
6. Determination of Copper (II) using standard hypo solution.
7. Estimation of strong acid by using strong base through conductometric titration method.
8. Estimation of strong acid by using strong base through potentiometric titration method.
9. Preparation of polymer (Demo).
10. Determination of Vitamin 'C'.
11. Determination of Pour and Cloud Point of lubricating oils

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

II SEMESTER	L	T	P	C
	-	-	3	1.5
20HS2L02 :: ENGLISH COMMUNICATIONS LAB				

COURSE OBJECTIVES

1. To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. To assist students to carry on the tasks and activities through guided instructions and materials.
4. To effectively integrate English language learning with employability skills and training.
5. To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
6. To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) Reading Skills.

- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:

- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:

- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

RELATIONSHIP OF COURSE TO PROGRAMME OUTCOMES

A	Ability to apply knowledge of mathematics, science, and engineering.	
B	Ability to design and conduct experiments, as well as to analyze and interpret data.	
C	Ability to design an Engineering system, component, or process.	
D	Ability to function on multi-disciplinary teams	

E	Ability to identify, formulate and solve engineering problems.	
F	Understanding of professional and ethical responsibility.	
G	Ability to communicate effectively	√
H	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.	√
I	Recognition of the need for and an ability to engage in life-long learning.	
J	Knowledge of contemporary issues.	
K	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practices.	
L	Ability to find location of substations and benefits derived through their optimal location.	

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

SYLLABUS

UNIT	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:

"InfoTech English" by Maruthi Publications

Reference Books:

1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

Testing Pattern:

B) Internal lab Exam: **30 Marks**

Regular performance in the language /communication /lab completion in the lab manual 15M

Written test 15M

B) External lab Exam Pattern: **70 Marks**

Written test 30M

Oral test 30M

Viva (during exam marks will be awarded by external examiner) 10M

III SEMESTER	L	T	P	C
	3	-	-	3
20MA3T07 :: PROBABILITY AND STATISTICS				

COURSE OBJECTIVES:

1. To familiarize the students with the foundations of probability and statistical methods
2. To impart probability concepts and statistical methods in various applications of Engineering
3. To introduce the correlation and regression and method of least squares

COURSE OUTCOMES:

At the end of this unit, the student will be able to

1. Make use of the concepts of probability and their applications (k_3)
2. Apply discrete and continuous probability distributions(K_3)
3. Use the components of a classical hypotheses test(K_3)
4. Examine Significance tests based on small and large sampling tests(K_3)
5. Use correlation methods and principle of least squares, regression lines (K_3)

Unit-1 Probability and Random Variables:

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Unit-2 Probability distributions:

Probability distributions**:** Binomial, Poisson and normal distribution –their properties.

Unit-3 Sampling distribution and Testing of hypothesis, large sample tests:

Basic terminology in sampling, sample techniques (with and without replacement), sampling distribution of means for large and small samples (with known and unknown variance).

Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors.

Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Unit-4 Small sample tests:

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F- test), Chi-square test for goodness of fit and independence of attributes.

Unit-5 Curve Fitting and Correlation:

Curve Fitting: Method of least squares -Fitting a straight line, Second degree parabola -exponential curve-power curves

Correlation: Simple correlation, correlation coefficient (for ungrouped data), rank correlation. Linear regression, regression lines, regression coefficients.

Text Books:

1. Probability and Statistics by Dr. K. Murugesan &P.Gurusamy, Anuradha Publications,2011
2. Higher Engineering Mathematics, 43rd Edition, Khanna Publications by Dr. B.S.Grewal,2012

Reference:

1.Ramana B.V., Higher Engineering Mathematics, Tata Mc Graw Hill New Delhi 11th Reprint2010
2.Miller & FreundProbability and statistics for engineers by Richard A. Johnson, PHI publications ,2011

III SEMESTER	L	T	P	C
	3	-	-	3
20AM3T01 :: DATA STRUCTURES AND ALGORITHMS				

COURSE OBJECTIVES:

1. To impart the basic concepts of data structures and algorithms.
2. To be familiar with writing recursive methods.
3. To implement operations on Linked List, Stack and Queues.
4. To implement traversal operations of trees and graphs.
5. To understand concepts about various algorithm design techniques, searching and sorting techniques.

COURSE OUTCOMES:

On completion of the course the student will be able to

CO1: Understand the concept of recursive algorithms.
CO2: Demonstrate the different types of data structures.
CO3: Able to understand the operations on linear data structures.
CO4: Summarize searching and sorting techniques.
CO5: Choose appropriate data structure as applied to specified problem definition.
CO6: Understand and implement the various algorithm design techniques.

UNIT- 1:

INTRODUCTION TO ALGORITHMS: Introduction to Data vs Information - Data Structures - Classification – Abstraction - Abstract data types (ADT) - Array - characteristics - Storage Representations. Array Order Reversal – Recursion - Array operations, Algorithm - complexity – Time and Space trade off.

UNIT- 2:

LINKED LIST: Array vs Linked List – Singly linked list - Representation of a linked list in memory - Operations on a singly linked list - Merging two singly linked lists into one list - Reversing a singly linked list – Polynomial Manipulation using List - Advantages and disadvantages of singly linked list - Circular linked list - Doubly linked list - Circular Doubly Linked List.

UNIT -3:

STACKS & QUEUES: Introduction – Array Representation of a Stack – Linked List Representation of a Stack - Stack Operations - Algorithm for Stack Operations - Stack Applications: Tower of Hanoi - Infix to postfix Transformation - Evaluating Arithmetic Expressions. Queue – Introduction – Array Representation of Queue – Linked List Representation of Queue - Queue Operations - Algorithm for Queue Operations -. Queue Applications: Priority Queue.

UNIT -4:

TREES AND GRAPHS: Preliminaries of Tree ADT - Binary Trees - The Search Tree ADT–Binary Search Trees - AVL Trees - Tree Traversals - B-Trees - Heap Tree – Preliminaries of Graph ADT - Representation of Graph – Graph Traversal - BFS – DFS – Applications of Graph – Shortest - Path Algorithms – Dijkstra's Algorithm, Minimum Spanning Tree – Prims Algorithm

UNIT- 5:

ALGORITHM DESIGN TECHNIQUES & SEARCHING AND SORTING TECHNIQUES: Divide and Conquer Strategy – Greedy Algorithm – Dynamic Programming – Backtracking Strategy - List Searches using Linear Search - Binary Search - Fibonacci Search - Sorting Techniques - Insertion sort - Heap sort - Bubble sort - Quick sort - Merge sort - Analysis of sorting techniques.

TEXT BOOKS:

1. Jean-Paul Tremblay, Paul G. Sorenson, 'An Introduction to Data Structures with Application', TMH, 2017.
2. Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2nd Edition, 2004.

REFERENCE BOOKS:

1. Larry R. Nyhoff, ADTs, Data Structures, and Problem Solving with C++, Prentice Hall Edition, 2004.
2. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010.

III SEMESTER	L	T	P	C
	3	-	-	3
20CS3T02 :: DATABASE MANAGEMENT SYSTEM				

COURSE OBJECTIVES:

The objectives of the course is

1. To describe a sound introduction to the discipline of database management systems.
2. To give a good formal foundation on Entity- Relationship (E-R) model, the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.
5. To provide an overview of transaction management, Database storage and indexing techniques.

COURSE OUTCOMES:

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

CO1: Explain the basic concepts of database management system and design an Entity-Relationship (E-R) model and convert E-R model to relational model.

CO2: Construct database using Relational algebra and SQL.

CO3: Apply Normalization techniques to normalize the database.

CO4: Discuss transaction management using different concurrency control protocols and recovery algorithms.

CO5: Illustrate different file organization and indexing methods.

UNIT-I

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages, Database Architecture, Database Users and Administrators.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations.

Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

UNIT-II

Relational Algebra: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division.

SQL: Form of Basic SQL Query - Examples of Basic SQL Queries, UNION, INTERSECT, and EXCEPT, Introduction to Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Outer Joins, Disallowing NULL values, Triggers.

UNIT-III

SCHEMA REFINEMENT AND NORMAL FORMS: Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT-IV

Transaction Management - The ACID Properties - Transactions and Schedules- Concurrent Execution of Transactions- Lock-Based Concurrency Control- 2PL, Serializability, and Recoverability- Dealing With Deadlocks - Concurrency Control without Locking.

CRASH RECOVERY: Introduction to ARIES- The Log - The Write-Ahead Log Protocol – Checkpoints - Recovering from a System Crash(ARIES) - Media Recovery.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing- Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke, “Data base Management Systems”, 3rd Edition, McGrawHill Education, 2014.
2. A.Silberschatz, H.F. Korth, S.Sudarshan, “Data base System Concepts”, 6th edition, McGraw Hill, 2016.
3. Brahmankar Pankajb, Sadaf Lqbal Shaikh, Raut Bhakti, “Database Management System”, 1st Edition, tech-neo, 2019.

REFERENCE BOOKS:

1. Ramez Elmasri, Shamkant B Navathe “Fundamentals of Database Systems”, 7th Edition, 2016.
2. C.J. Date, “Introduction to Database Systems”, 8/e, Pearson, 2012.
3. Rob, Coronel, “Database System Design, Implementation and Management”, 5/e, Thomson, 2012.

III SEMESTER	L	T	P	C
	3	-	-	3
20CS3T03 :: COMPUTER ORGANIZATION AND ARCHITECTURE				

COURSE OUTCOMES:

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

CO1: Describe the basic structure of computer organization and its instruction sets

CO2: Define the CPU operations and language concepts

CO3: Explain the arithmetic algorithms and decimal arithmetic operations

CO4: Demonstrate input/output and memory organization in the computer systems

CO5:. Express the concept of pipelining and various processor families.

UNIT -I:

Basic Structure of Computers and Machine Instructions: Basic Organization of Computers, Von Newmann Computers, Functional Units, Basic Operational Concepts, Generation of computers. Numbers, Arithmetic Operations and Instructions, Memory Locations and Addresses, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input / Output Operations, Stacks and Queues, Case study – Arithmetic & Logic Instructions, Branch Instructions, I/O Operations of ARM Processor

UNIT -II:

Central Processing Unit and Programming the basic Computer: CPU - General Register and Stack Organizations, Instructions Formats, Addressing Modes, Data Transfer and Manipulation, RISC, Programming the Basic Computer – Machine Language, Assembly Language, Programming Arithmetic and Logic Operations, Micro Program Examples, Case Study – Design of Control Unit.

UNIT- III:

Computer Arithmetic: Addition, Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT -IV:

Input-Output and Memory Organization: Accessing I/O Devices, Interrupts, Direct Memory Access, Buses, Interface Circuits, Standard I/O interfaces, Case Study – Processor Examples Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

UNIT -V:

Pipelining and Processor Families: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction sets, Data Path and control consideration, Superscalar Operation, Performance Considerations. ARM family, Motorola 680X0 and Coldfire families, Intel IA 64 Family, SPARC Family.

TEXT BOOKS:

1. Carl Hamacher, Zvonks Varanesic, SafeaZaky, “Computer Organization”, Fifth Edition, McGraw Hill,2015
2. M. Moris Mano, Revised, “Computer System Organization”, Third Edition, Pearson PTE academic,2019

3. Pynabananda Chskraborty, “Computer Organization &Architecture”, 1st Edition, Chapman and Hallkrc,2020.

REFERENCE BOOKS:

1. William Stallings, “Computer Organization and Architecture”, Sixth Edition, Pearson/PHI, 2016.
2. John L. Hennessy and David A. Patterson, “A quantitative approach, Computer Organization”, FourthEdition, Elsevier, 2009.
3. Andrew S.Tanenbaum, “Structured Computer Organization”, 4th Edition, Pearson, 1998
4. Sivaraama, Dandamudi, “Fundamentals of Computer Organization and Design”, Springer Int. Edition,2014.

III SEMESTER	L	T	P	C
	3	-	-	3
20CD3T01 :: DATA SCIENCE				

Course Objectives:
From the course the student will learn

- Provide you with the knowledge and expertise to become a proficient datascientist.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
- Produce Python code to statistically analyze a dataset;
- Critically evaluate data visualizations based on their design and use forcommunicating stories from data

Course Outcomes:
By the end of the course, student will be able to

- Acquire the knowledge and expertise to become a proficient data scientist
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Explain how data is collected, managed and stored for data science
- Interpret the key concepts in data science, including their real-worldapplications and the toolkit used by data scientists
- Illustrate data collection and management scripts using MongoDB

UNIT-I: Introduction to Core Concepts and Technologies- Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

UNIT-II: Data Collection and Management- Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources.

UNIT-III: Data Analysis- Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Basic machine learning algorithms, Linear regression,SVM, Naive Bayes.

UNIT-IV:
Data Visualization- Introduction, Types of data visualization, **Data for visualization-** Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.

UNIT-V: Applications of Data Science- Technologies for visualization, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Text Books:

1. "The Art of Data Science", 1st edition, Roger D. Peng and Elizabeth matsui,Lean Publications, 2015
2. "Algorithms for Data Science", 1st edition, Steele, Brian, Chandler,John, Reddy, Swarna, springers Publications, 2016

Reference Books:

1. Doing Data Science: Straight Talk From The Frontline, 1st edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
2. Mining of Massive Datasets, 2nd edition, Jure Leskovek, Anand Rajaramanand Jeffrey Ullman, v2.1, Cambridge University Press, 2014

III SEMESTER	L	T	P	C
	-	-	3	1.5
20AM3L01 :: DATA STRUCTURES AND ALGORITHEMS LAB				

COURSE OBJECTIVES:

1. To implement linear and non-linear data structures.
2. To understand the different operations of linear and linear data structures.
3. To implement linear search and binary Search.
4. To get familiarized to sorting algorithms.
5. To exploit appropriate algorithm for the problem.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Remembering the concept of data structures through ADT including List, Stack and Queues and its operations.

CO2: Understand the operations on Trees and Graphs.

CO3: Able to apply and implement various sorting algorithms and ensure their correctness.

CO4: Ability to analyze algorithms and develop algorithms through step-by-step approach in solving problems with the help of fundamental data structures.

CO5: Understand the concepts of various Algorithm Design techniques. Design applications and justify use of specific linear data structures for various applications

CO6: Apply algorithms for real time problem solving

LIST OF EXPERIMENTS

1. Implement operations on Array using C.
2. Implement operations on a Singly linked list using C.
3. Implement operations on a Doubly linked list using C.
4. Implement a Stack using an Array and Linked list using C.
5. Convert an infix expression to postfix expression using C.
6. Implement Queue using an Array and Linked list using C.
7. Implement Circular Queue using C.
8. Implement display elements of a Queue according to their priority using C.
9. Search an element using Linear and Binary Search using C.
10. Binary search tree implementation using linked list and possible operations on binary search trees using C.
11. Implement the concepts of In-order, preorder and post order traversals using C.
12. Implement Depth first and Breadth first traversal in graphs using C.
13. Sort the elements using insertion sort using C.
14. Sort the elements using quick sort using C.
15. Sort the elements using merge sort using C.

TEXT BOOKS:

3. Jean-Paul Tremblay, Paul G. Sorenson, 'An Introduction to Data Structures with Application', TMH, 2017.
4. Richard F, Gilberg, Forouzan, "Data Structures", Cengage, 2nd Edition, 2004.

REFERENCE BOOKS:

3. Larry R. Nyhoff, ADTs, Data Structures, and Problem Solving with C++, Prentice Hall Edition, 2004.
4. Thomas H. Cormen, Charles E. Leiserson, "Introduction to Algorithms", 3rd Edition, 2010.

III SEMESTER	L	T	P	C
	-	-	3	1.5
20CS3L02 :: DATABASE MANAGEMENT SYSTEMS LAB				

COURSE OUTCOMES:

At the end of the course student able to

CO1: Understand the different issues involved in the design and implementation of a database system

CO2: Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.

CO3: Create and maintain tables using SQL

CO4: Populate and query a database using SQL DML/DDL commands.

CO5: Understand the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization.

CO6: Acquire a good understanding of database systems concepts and to be in a position to use and design databases for different applications.

LIST OF EXPERIMENTS:

1. Create a table STUDENT with appropriate data types and perform the following queries.
   Regdno, student name, date of birth, branch and year of study.
   a. Insert 5 to 10 rows in a table
   b. List all the students of all branches
   c. List student names whose name starts with ‘s’
   d. List student names whose name contains ‘s’ as third literal
   e. List student names whose contains two ‘s’ anywhere in the name
   f. List students whose branch is NULL
   g. List students of AIML who born after 1985
   h. List all students in reverse order of their names
   i. Delete students of any branch whose name starts with ‘s’
   j. Display student name padded with ‘*’ after the name of all the students

2. Create the following tables with appropriate data typesand constraints.
   EMPLOYEE (Fname, Mname, Lname, SSN, Bdate, Address, Gender, Salary, SuperSSN,Dno)
   DEPARTMENT(Dnumber, Dname, MgrSSN, Mgrstartdate)
   DEPENDENT (ESSN, Dependent_Name, Gender, Bdate, Relationship)
   a. Insert 5 to 10 rows into all the tables.
   b. Display all employee’s names along with their department names.
   c. Display all employee’s names along with their dependent details.
   d. Display name and address of all employees who work for ‘AIML’ department.
   e. List the names of all employees with two or more dependents.
   f. List the names of employee who have no dependents.
   g. List the names of employees who have at least one dependent.
   h. List the names of the employees along with names of their supervisors using aliases.
   i. Display name of the department and name of manager for all the departments.

j. Display the name of each employee who has a dependent with the same first name and gender as the employee.
k. List the names of managers who have at least one dependent.
l. Display the sum of all employees' salaries as well as maximum, minimum and average salary in the entire departments department wise if the department has more than two employees.
m. List the departments of each female employee along with her name.
n. List all employee names and also the name of the department they manage if they happen to manage a dept

3. Consider the following schema for a Library Database:
BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Branch_id, No-of_Copies)
BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out,Due_Date)
LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

Write SQL queries to
a. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch
b. Get the particulars of borrowers who have borrowed more than 3 books in particular period.
c. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation
d. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query
e. Create a view of all books and its number of copies that are currently available in the Library.
f. Apply Drop, Alter, Order by, Group By clauses on the above tables.

4. Create the following tables for university database
Department (deptname, building, budget, primary key (dept name))
Course (courseid, title, deptname, credits, primary key (course id))
Instructor (ID, name, deptname, salary, primary key (ID), foreign key (deptname) references department);
Section(courseid, sec id, semester, year, building, room number, time slot id, primary key (courseid, sec id, semester, year),foreign key (course id) references course);
Teaches (ID, course id ,sec id ,semester ,year numeric ,primary key (ID, course id, sec id, semester, year),foreign key (course id, sec id, semester, year) references section ,foreign key (ID) references instructor);
a. List the names of instructors along with the titles of courses that they teach
b. Find the names of all instructors whose salary is greater than at least one instructor in the AIML department
b. To find the set of all courses taught in the Even as well as in Odd semester
c. Find the average salary of instructors in the Computer Science department
d. Find the average salary in each department
e. To find all the courses taught in the Even semester in current year but not in previous year in the same semester
f. Delete all instructors with a salary between 15,000 and 35,000.

5. Create the following tables based on the above Schema Diagram with appropriate data types and constraints and perform the following queries.
   SAILORS (Saild, Salname, Rating, Age)
   RESERVES (Sailid, boatid, Day)
   BOATS (Boatid, Boat-name, Color)
   a. Insert 5 to 10 rows in all tables?
   b. Find the name of sailors who reserved boat number 3.
   c. Find the name of sailors who reserved green boat.
   d. Find the colors of boats reserved by Particular Sailor
   e. Find the names of sailors who have reserved at least one boat.
   f. Find the all sailid of sailors who have a rating of 10 or have reserved boated 104.
   g. Find the Sailid‘s of sailors with age over 20 who have not registered a red boat.
   h. Find the names of sailors who have reserved a red or green boat.
   i. Find sailors whose rating is better than some sailor called _Salvador‘.
   j. Find the names of sailors who are older than the oldest sailor with a rating of 10.

6. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features
   a. Write a PL/SQL Block to find whether the number is Armstrong or not.
   b. Write a PL/SQL program for generating Fibonacci series
   c. Write a PL/SQL program to print given number in reverse
   d. print different patterns using PL/SQL program
   e. Print Floyd’s triangle in PL/SQL
   f. Count odd and even digits in a number in PL/SQL

7. Write a program that updates salaries of all employees with 10 % hike (use cursors).
8. Write a program to fetch salary and employee name from employee table for a given user input. When no data found raise an exception that prints the message “no data found”.
9. Write a program to find the number of records of any given table using % ROWCOUNT.
10. Write a database trigger on employee table so that the trigger fires when all the DML statements are executed (print appropriate message).
11. Write a trigger in such a way that it should not allow insert or update or delete on Saturday and Sunday and display the proper message.
12. Write a database trigger on employee table so that the trigger fires when all the DML statements are executed (print appropriate message)
13. Write a cursor to display the list of employees and total salary department wise.
14. Write a procedure to display the name and salary of employee when user inputs SSN using IN/OUT parameters.
15. Write a function to check the validity of the given employee number from the employee table (print the appropriate message using PL/SQL block)
16. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc.

IV SEMESTER	L	T	P	C
	-	-	3	1.5
20CD3L01 :: DATA SCIENCE LAB				

Course Outcomes: Upon completion of the course, the students will be able to

CO1: Develop relevant programming abilities.

CO2: Demonstrate knowledge of statistical data analysis techniques

CO3: Exhibit proficiency to build and assess data-based models.

CO4: Demonstrate skill in Data management & processing tasks using Python

CO5: Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

NUMPY:

Practical Component: Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting. Computation on NumPy arrays using Universal Functions and Mathematical methods. Import a CSV file and perform various Statistical and Comparison operations on rows/columns. Load an image file and do crop and flip operation using NumPy Indexing

PANDAS:

Create Pandas Series and Data Frame from various inputs.
2. Import any CSV file to Pandas Data Frame and perform the following:
Visualize the first and last 10 records
Get the shape, index and column details
Select/Delete the records(rows)/columns based on conditions.
Perform ranking and sorting operations.
Do required statistical operations on the given columns.
Find the count and uniqueness of the given categorical values.
Rename single/multiple columns.

DATA CLEANING, PREPARATION AND VISUALIZATION

1.Import any CSV file to Pandas Data Frame and perform the following:

(a) Handle missing data by detecting and dropping/ filling missing values.
(b) Transform data using apply () and map () method.
(c) Detect and filter outliers.
(d) Perform Vectorized String operations on Pandas Series.
(e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

REGRESSION AND PREDICTION

1. Create a Linear Regression model for a dataset and display the error measures
2. Chose a dataset with categorical data and apply linear regression model

CLASSIFICATION

1. Apply Naïve Bayes algorithm on a dataset and estimate the accuracy
2. Apply Logistic Regression algorithm on a dataset and estimate the accuracy

III SEMESTER	L	T	P	C
	-	-	3	1.5
20CD3S01 : R PROGRAMMING LAB				

Prerequisites:

Any Programming Language.

COURSE OUTCOMES :

At the end of the Course, the Student will be able to:

CO1: Setup R Programming Environment.

CO2: Understand and use R – Data types.

CO3: Understand and use R – Data Structures.

CO4: Develop programming logic using R – Packages.

CO5: Analyze data sets using R – programming capabilities

LIST OF EXPERIMENTS:

1. Download and install R-Programming environment and install basic packages using install.packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc,.)
3. Write a program to find list of even numbers from 1 to n using R-Loops.
4. Create a function to print squares of numbers in sequence.
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Create a data set and do statistical analysis on the data using R.

Text Book:

1. Norman Matloff, The Art of R Programming, UC Davis 2009.

Web Reference:

1. https://www.r-project.org/

IV SEMESTER	L	T	P	C
	2	-	-	-
20CE3M01 :: ENVIRONMENTAL SCIENCE				

COURSE OUTCOMES:

At the end of the course student able to

CO1: Analyze the interconnections between sustainability, global environmental challenges, information technology, and ecosystems, and their importance in environmental conservation and human well-being.

CO2: Understand the natural resource management and associated problems.

CO3: Understanding of biodiversity and its conservation, including genetic, species, and ecosystem diversity.

CO4: Understanding of environmental pollution, including its definitions, causes, effects, and control measures for air pollution, water pollution, soil pollution, noise pollution, and nuclear hazards.

CO5: Understanding of social issues and their relation to the environment.

UNIT-I: Multidisciplinary nature of Environmental Studies:

Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II: Natural Resources:

Natural resources and associated problems. Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT-III: Biodiversity and its conservation:

Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV Environmental Pollution:

Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V Social Issues and the Environment:
Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.
Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.
The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

TEXT BOOKS:
1. K. V. S. G. Murali Krishna , Environmental Studies,VGS Publishers, Vijayawada, 2010
2. R. Rajagopalan, Environmental Studies, 2nd Edition, Oxford University Press, 2011
3. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani, Environmental Studies, 2nd Edition , Pearson Education, Chennai,2015

REFERENCE:
1. Deeshita Dave & P. Udaya Bhaskar Text Book of Environmental Studies, Cengage Learning, 2011
2. Shaashi Chawla, A Textbook of Environmental Studies, TMH, New Delhi,2017
3. Benny Joseph, Environmental Studies, Tata McGraw Hill Co, New Delhi, 2006
4. Anubha Kaushik, C P Kaushik , Perspectives in Environment Studies, New Age International Publishers, 2014.

IV SEMESTER	L	T	P	C
	3	-	-	3
20IT4T01 :: DISCRETE MATHEMATICS				

COURSE OBJECTIVES:

- Familiarise closed form solution of linear recurrence relations by various methods.
- To introduce basics of set theory and its applications
- Bring awareness of basic concepts of graphs and its applications.
- To teach the topics on Trees, spanning trees, minimal spanning trees and justification of Kruskal's algorithm.

COURSE OUTCOMES:

Upon successful completion of this course the student should be able to

CO1: Identify programming errors efficiently through enhanced logical capabilities (k_3)

CO2: Find a general solution of recurrence equation (k_3)

CO3: Learn set theory, graph of the relations which are used in data structures (k_3)

CO4: Explain the concepts in graph theory (k_3)

CO5: Apply graph theory concepts in core subjects such as data structures and network theory effectively. (k_3)

UNIT – I : MATHEMATICAL LOGIC

Connectives, negation, conjunction, disjunction, statement formula and Truth Tables, conditional and bi-conditional, well formed formulae, tautologies, equivalence of formulae, duality, tautological implications, functionally complete set of connectives, other connectives, principal disjunctive and conjunctive normal forms, inference calculus, rules of inference, consistency of premises, indirect method of proof, Theory of inference for the statement calculus, validity using Truth tables.

Learning Outcomes:

After completion of this unit, student will be able to

- find equivalence formulas, implementation of logic for mathematical proofs (k_1)
- apply inference theory to verify the consistence of data (k_3)

UNIT – II : RECURRENCE RELATIONS

Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of In homogeneous Recurrence Relation.

Learning Outcomes:

After completion of this unit student will be able to

- formulate recurrence relations of the sequences (k_3)
- solve homogeneous linear recurrence relations (k_3)
- evaluate complementary function and particular integral for non homogeneous linear recurrence relations (k_3)
- apply substitution method to solve non-linear recurrence relations (k_3)

UNIT – III : SET THEORY AND RELATIONS

Relations and ordering, Relations, Properties of binary Relations in a set, Relation Matrix and the Graph of a Relation, partition and covering of a set, Equivalence, Compatibility Relations, Composition of Binary Relations, Partial ordering, Hasse diagram, Principle of Inclusion-Exclusion, Pigeonhole Principle and its applications.

Learning Outcomes:

After completion of this module student will be able to

- draw Hasse Diagram for the given poset (k_3)
- apply principle of inclusion and exclusion and pigeonhole principle to real world problems (k_3)

UNIT – IV : GRAPH THEORY

Basic Concepts, Representation of Graph, Sub graphs, Multigraphs, Planar graphs, Euler Paths, Euler circuits, Hamiltonian Graphs and Graph Isomorphism and its related Problems, Chromatic Number.

After completion of this unit student will be able to

- identify different graphs and their properties (k_3)
- construct Euler and Hamiltonian graphs (k_3)
- construct the graph for the given data (k_3)

UNIT – V : TREES

Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees, Planar Graphs.

Learning Outcomes:

After completion of this unit student able to

- construct the spanning tree and binary tress from graphs (k_3)
- build minimal spanning tree by using different algorithms (k_3)

Text Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997.
2. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012.

References:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.
2. Richard Johnsonburg, Discrete Mathematics, 7/e, Pearson Education, 2008
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.

IV SEMESTER	L	T	P	C
	3	-	-	3
20CS4T01 :: OPERATING SYSTEMS				

COURSE OBJECTIVES:

The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

COURSE OUTCOMES:

At the end of the course student are able to

CO1: Define the Basic concepts about Operating System and its functions.
CO2: Describe Process management, CPU scheduling and Deadlocks.
CO3: Analyze Memory management
CO4: Describe and Implement File systems & Disk Structures.
CO5: Perform Case Study on LINUX, WINDOWS and Android OS.

UNIT – I:

OPERATING SYSTEMS OVERVIEW:

Introduction: OS Concepts – Evolution of OS, OS Structures- Kernel, Shell. Operating-System Services, System Calls, Types of System Calls, System Structure. UNIX- Introduction-Architecture, Logging In, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Time Values, System Calls and Library Functions, Command-Line Arguments, UNIX File API‘S.

UNIT – II:

PROCESS MANAGEMENT:

Process: Concept, Operations on Processes, Inter Process Communication, Threads-Multithreading Models, Threading Issues, Pthreads.

Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Critical Regions, Monitors, Classic Problems of Synchronization,

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms- CPU (Uniprocessor) scheduling algorithms, Multiprocessor and Real-time scheduling algorithms.

Deadlocks: Characterization – Prevention – Avoidance - Detection and Recovery

UNIT – III:

MEMORY MANAGEMENT: Basic Memory Management, Swapping, Contiguous Memory Allocation, Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms, Segmentation – Simple, Multi-level, Segmentation with Paging, Memory Management

UNIT – IV:

INFORMATION MANAGEMENT:

File system Interface: The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation: File system structure, allocation methods, free-space management

Mass-storage structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, Disk Management, Swap-Space Management, RAID Structure.

UNIT – V:

CASE STUDY:

The Linux System, Microsoft Windows 7, Android Software Platform**:** Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, ―Operating Systems– Internals and Design‖, 7th Edition, Prentice Hall, 2016.
3. Alex A Aravind, Operating Systems-S Halder, Second Edition, Pearson Education, 2016.
4. Andrew Tanenbaum, Herbert Bos, ―Operating Systems‖, 4th Edition, 2015.

Reference Books:

1. Ann McIver McHoes Ida M. Flynn, ―Understanding Operating Systems‖ Sixth Edition, Course Technology-Cengage Learning, 2011.
2. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Second Edition, Addison Wesley, 2001.
3. Andrew S. Tanenbaum, Albert S. Woodhull - Amherst, ―Operating Systems Design and Implementation‖, Third Edition, Prentice Hall, 2006.
4. W. Richard Stevens, ―Advanced Programming in UNIX Environment‖, 2nd Ed, Pearson Education, 2005.
5. Terrence Chan, ―UNIX System Programming Using C++‖, Prentice Hall India, 1999.

E-Reference:

http://nptel.iitm.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html

IV SEMESTER	L	T	P	C
	3	-	-	3
20AD4T02 :: ARTIFICIAL INTELLIGENCE				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Define the fundamentals of AI techniques and search techniques.
2. Use appropriate search algorithms for any AI problem.
3. Represent a problem using first order and predicate logic.
4. Understand the concepts of non-monotonic reasoning.
5. Acquire the knowledge of various AI applications

UNIT – I Introduction

Artificial Intelligence definition, AI problems, Problem Spaces, Defining the Problem as a State Space Search, problem characteristics, production Systems. Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT - II Problem solving Methods

Issues in the design of search programs, Search Strategies- Uninformed (Breadth-First, Depth-First Search), Informed (Heuristic) - Local Search Algorithms and Optimization Problems Generate-And-Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm) - Constraint Satisfaction Problems, Backtracking Search - Game Playing - Optimal Decisions in Games – Minimax Search, Alpha - Beta Pruning - Stochastic Games

UNIT - III Knowledge Representation

Representing Simple Facts in Predicate Logic, First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution, Natural Deduction – Knowledge Representation - Ontological Engineering, Categories and Objects, Events, Mental Events and MentalObjects, Reasoning Systems for Categories, Reasoning with Default Information

UNIT - IV Uncertain Knowledge and Reasoning

Introduction to Non-Monotonic Reasoning, acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes‟ Rule and Its Use, Representing Knowledge in an Uncertain Domain, Probability and Bayes Theorem, The Semantics of Bayesian Networks

UNIT - V Applications

AI applications – Language Models – Information Retrieval- Information Extraction – Expert Systems – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception– Planning – Moving

Text Books:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition,2009.
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011
3. Elaine Rich, Kevin Knight, Shiva Sankar B. Nair, Artificial Intelligence, The McGraw Hillpublications, Third Edition, 2017.
4. Bratko, Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-WesleyEducational Publishers Inc., 2011.

Reference Books:

1. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving,Pearson Education, 6th ed., 2009.
2. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”,Cambridge University Press 2010.
3. Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI, 2010.

Web Resources:

1. https://nptel.ac.in/courses/106105077
2. https://nptel.ac.in/courses/106106126
3. https://aima.cs.berkeley.edu
4. https://ai.berkeley,edu/project_overview.html

IV SEMESTER	L	T	P	C
	3	-	-	3
20CD4T01 :: DATA MINING AND DAT WEARHOUSING				

Course Objectives:

- To understand and implement classical models and algorithms in data warehousing anddata mining.
- To analyze the data, identify the problems, and choose the relevant models and algorithmsto apply.
- To assess the strengths and weaknesses of various methods and algorithms and to analyzetheir behavior.

Course Outcomes:

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

CO1: Summarize the architecture of data warehouse

CO2: Apply different preprocessing methods, Similarity, Dissimilarity measures for any givenraw data.

CO3: Construct a decision tree and resolve the problem of model overfitting

CO4: Compare Apriori and FP-growth association rule mining algorithms for frequent itemsetgeneration

CO5: Apply suitable clustering algorithm for the given data set

UNIT- I

Data Warehouse and OLAP Technology: An Overview: Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

UNIT- II

Data Mining: Introduction, Data Mining, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality.

Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binarization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan &Vipin)

UNIT -III

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction.

Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan &Vipin)

UNIT -IV

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FP-Growth Algorithm. (Tan &Vipin)

UNIT -V

Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K- means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin)

Text Books:

1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier,2011

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning,2010
2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008
4. Data Mining Techniques, Arun K Pujari, Universities Press, 2001

Web Resources:

1. NPTEL Online Course on Data Mining : https://onlinecourses.nptel.ac.in/noc18_cs14/preview

IV SEMESTER	L	T	P	C
	3	-	-	3
20BM4T01 :: MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS				

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

CO1: Understand the nature and scope of managerial economics, its relation to other disciplines, and the concept of demand.

CO2: Analyze production and cost in a business context, understanding the production function, the law of variable proportions, isoquants, and isocosts.

CO3: Understand and analyze different market structures, including perfect competition, monopoly, monopolistic competition, and oligopoly.

CO4: Understand various forms of business organizations, such as sole proprietorship, partnership, joint-stock companies, and state/public enterprises.

CO5: Understand capital budgeting concepts and sources, and apply techniques to evaluate capital budgeting decisions through simple problem analysis.

UNIT–I:

Managerial Economics and Demand Analysis: Definition – Nature and Scope of Managerial Economics - Relation with other disciplines - Concept of Demand-Types-Determinants - Law of Demand - Elasticity of Demand - Types and Measurement-Demand forecasting.

UNIT–II:

Production and Cost Analysis: Production function - Law of Variable proportions - Isoquants and Iso costs -Law of returns- Economies of Scale - Cost Concepts - Cost Volume Profit Analysis – Applications of BEP (Simple Problems).

UNIT-III:

Market Structures and Pricing Policies: Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly – Features – Price & Output Determination - Pricing Methods.

UNIT-IV:

Forms of Organizations and Business Cycles: Business Organization- Sole Trader – Partnership - Joint Stock Company - State/Public Enterprises and their forms - Business Cycles: Meaning and Features - Phases of Business Cycle.

UNIT–V:

Capital Budgeting and Accounting: Concept and sources-Techniques of evaluating capital budgeting(Simple problems)

Introduction to Accounting: Branches-Systems of Accounting-Single Entry-Double Entry System-Journal-Ledger-Trail Balance-Final Accounts-Ratio Analysis(Simple problems)

TEXTBOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. T.V.Ramana& B. Kuberudu: Managerial Economics and Financial Analysis, Himalaya Publishing House, Mumbai
3. Varshney &Maheswari: Managerial Economics, Sultan Chand, 2003.

REFERENCE BOOKS:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey &Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson. 7. Narayanaswamy: Financial Accounting A Managerial Perspective, PHI.
8. Raghunatha Reddy &Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari& S.K. Maheswari, Financial Accounting, Vikas.

IV SEMESTER	L	T	P	C
	-	-	3	1.5
20AD4L01 :: ARTIFICIAL INTELLIGENCE LAB				

Course Outcomes

After the completion of the course the students are able to

CO1: Understand the concept of Artificial intelligence.
CO2: Apply various search algorithms of artificial intelligence.
CO3: Apply knowledge representation and reasoning techniques.
CO4: Understand & apply different types of machine learning and models.
CO5: Develop proficiency in programming languages commonly used in AI.

List of Experiments

1. Write a program in prolog to implement simple facts and Queries
2. Write a program in prolog to implement simple arithmetic
3. Write a program in prolog to solve Monkey banana problem
4. Write a program in prolog to solve Tower of Hanoi
5. Write a program in prolog to solve 8 Puzzle problems
6. Write a program in prolog to solve Traveling salesman problem
7. Write a python program to implement simple Chatbot?
8. Write a python program to implement Breadth First Search Traversal?
9. Write a python program to implement Depth First Search Traversal?
10. Write a python program to implement Water Jug Problem?
11. Write a program to implement Tic-Tac-Toe game using python.
12. Write a program to implement Missionaries and Cannibals problem using python.

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IV SEMESTER	L	T	P	C
	-	-	3	1.5
20CS4L02 :: OPERATING SYSTEMS LAB				

OBJECTIVES:

- The man objective of this course is to implement operating systems.

COURSE OUTCOMES:

At the end of the course students are able to

CO1: Interpret with the UNIX/LINUX environment

CO2: Infer the fundamentals of shell scripting/programming

CO3: Describe CPU scheduling and Write programs on it.

CO4: Demonstrate Bankers Algorithm for Dead Lock Avoidance.

CO5: Explain Disk allocation methods and Write programs on it.

CO6: Describe Page Replacements algorithms and Write programs on it.

LIST OF PROGRAMS:

1. a) Study of Vi editor, Bash Shell, Bourne Shell and C Shell in UNIX/LINUX Operating System.

a) Study of UNIX/LINUX general purpose utility command list man,who,cat, cd, cp, ps, ls, mv,rm,mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.

b) Study of Unix/Linux file system (tree structure).

e) Study of .bashrc, /etc/bashrc and Environment variables.

2. UNIX/LINUX based exercises to practice/simulate File system related system calls and some of the process management concepts in LINUX Environment.

a) Write a C program that makes a copy of a file using standard I/O, and system calls

b) Write a C program to emulate the UNIX ls –l command.

c) Write a C program that illustrates how to execute two commands concurrently with a command pipe Ex:

- ls –l | sort.

d) Write a C program that illustrates two processes communicating using shared memory.

e) Write a C program to simulate producer and consumer problem using semaphores.

f) Write C program to create a thread using pthreads library and let it run its function.

g) Write a C program to illustrate concurrent execution of threads using pthreads library.

3. Simulate FCFS and SJF CPU scheduling algorithm.
4. Simulate Priority CPU scheduling algorithm.
5. Simulate Round Robin CPU scheduling algorithm.
6. Simulate Bankers Algorithm for Dead Lock Avoidance.
7. Simulate Sequential file allocation strategy.
8. Simulate Linked file allocation strategy.
9. Simulate Indexed file allocation strategy.
10. Simulate First In First Out page replacement algorithm.
11. Simulate Least Recently used page replacement algorithm.
12. Simulate optimal page replacement algorithm.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, –Operating System Concepts‖, 10th Edition, John Wiley and Sons Inc., 2018.
2. William Stallings, ―Operating Systems– Internals and Design‖, 7th Edition, Prentice Hall, 2016.
3. Alex A Aravind, Operating Systems-S Halder, Second Edition, Pearson Education, 2016.
4. Andrew Tanenbaum, Herbert Bos, –Operating Systems‖, 4th Edition, 2015.

Reference Books:

1. Ann McIver McHoes Ida M. Flynn, –Understanding Operating Systems‖ Sixth Edition, Course Technology-Cengage Learning, 2011.
2. Andrew S. Tanenbaum, –Modern Operating Systems‖, Second Edition, Addison Wesley, 2001.
3. Andrew S. Tanenbaum, Albert S. Woodhull - Amherst, –Operating Systems Design and Implementation‖, Third Edition, Prentice Hall, 2006.
4. W. Richard Stevens, ―Advanced Programming in UNIX Environment‖, 2nd Ed, Pearson Education, 2005.
6. Terrence Chan, –UNIX System Programming Using C++‖, Prentice Hall India, 1999.

E-Reference:

http://nptel.iitm.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html

IV SEMESTER	L	T	P	C
	-	-	3	1.5
20CD4L03 :: DATA MINING AND DATA WAREHOUSING LAB				

OBJECTIVES:

- Practical exposure on implementation of well-known data mining algorithms
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.

COURSE OUTCOMES:

CO1: Learn techniques for data cleaning, transformation, and feature engineering to prepare data for mining.

CO2: Apply preprocessing techniques on real world datasets

CO3: Apply apriori algorithm to generate frequent itemsets

CO4: Apply Classification and clustering algorithms on different datasets.

CO5: Apply data warehousing concepts and techniques to real-world scenarios

1. Demonstrate the following data preprocessing tasks using python libraries.
   a) Loading the dataset
   b) Identifying the dependent and independent variables
   c) Dealing with missing data

2. Demonstrate the following data preprocessing tasks using python libraries.
   a) Dealing with categorical data
   b) Scaling the features
   c) Splitting dataset into Training and Testing Sets

3. Demonstrate the following Similarity and Dissimilarity Measures using python
   a) Pearson's Correlation
   b) Cosine Similarity
   c) Jaccard Similarity
   d) Euclidean Distance
   e) Manhattan Distance

4. Build a model using linear regression algorithm on any dataset.
5. Build a classification model using Decision Tree algorithm on iris dataset
6. Apply Naïve Bayes Classification algorithm on any dataset
7. Generate frequent itemsets using Apriori Algorithm in python and also generate associationrules for any market basket data.
8. Apply K- Means clustering algorithm on any dataset.
9. Apply Hierarchical Clustering algorithm on any dataset.
10. Apply DBSCAN clustering algorithm on any dataset.

IV SEMESTER	L	T	P	C
	1	-	2	2
20AM4S01 :: MOBILE APPLICATIONS DEVELOPMENT LAB				

COURSE OBJECTIVES:

- To understand the components and structure of mobile application development frameworks for Android and Windows OS based mobiles.
- To understand how to work with various mobile application development frameworks. · To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

COURSE OUTCOMES:

At the end of this course, students will be able to:

CO1: Identify various concepts of mobile programming that make it unique from programming for other platforms
CO2:Critique mobile applications on their design pros and cons
CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces, program mobile applications for the Android operating system that use basic and advanced phone features and
CO4:Deploy applications to the Android marketplace for distribution.

LIST OF EXPERIMENTS

1. Introduction to mobile technologies and devices , Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colors
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information
11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs (Mini Project)

References:

1. Android Programming unleashed , B.M. Harwani, Pearson, 2013.
2. Android Programming (Big Nerd Ranch Guide), by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. Android Programming – Pushing the limits by Hellman by Erik Hellman, WILEY, 2013

Web References:

1. The Complete Android N Developer Course –Udemy
https://www.udemy.com/course/complete-android-n-developer-course/?altsc=428526
2. Android Development Courses on Google developers training
https://developers.google.com/training/android/
3. Mobile Computing - Video course- NPTEL
https://nptel.ac.in/courses/106/106/106106147/#
Android Tutorial – Tutorial Point https://www.tutorialspoint.com/android/index.htm

IV SEMESTER	L	T	P	C
	2	-	-	-
20BM4M01 :: INDIAN CONSTITUTION				

COURSE OUTCOMES:

At the end of this course, students will be able to:

CO1: Uunderstand the Indian Constitution, including its meaning, sources, and constitutional history.

CO2: Uunderstand the structure and functioning of the Indian Union government and its administrative framework.

CO3: Understanding of the state government and its administration.

CO4: Understanding of local administration, including the role and importance of the head of district administration.

CO5: Understand the role and functions of the Election Commission, including the Chief Election Commissioner and the Election Commissionerate.

UNIT- I:

Introduction to Indian Constitution-Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT- II:

Union Government and Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, powers and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

UNIT- III:

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

UNIT- IV:.

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions of Pachayat Raj Institution: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT- V:

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate -State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women.

Textbooks:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics

Reference Books:

1. D.C. Gupta, Indian Government and Politics
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. J.C. Johari, Indian Government andPolitics Hans
4. J. Raj IndianGovernment and Politics
5. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
6. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

IV SEMESTER	L	T	P	C
	3	0	2	4
20AD4M01 :: EVOLUTION OF ARTIFICIAL INTELLIGENCE				

COURSE OUTCOMES:

At the end of this course, students will be able to:

1. Gain a deep understanding of AI's definition, scope, and historical roots, including milestones
2. Assess the significance of key developments in AI
3. Develop knowledge of state-of-the-art AI methodologies
4. Examine the ethical, social, and economic challenges posed by AI
5. Understand emerging trends like AGI, quantum AI, and neuromorphic computing

Unit - 1: Introduction to Artificial Intelligence

Definition and Scope of AI - Historical Background: Origins of AI (1940s–1950s) - Milestones in AI Development (e.g., Dartmouth Conference, ELIZA) - Philosophical Foundations: The Turing Test, Symbolic Reasoning - Early Approaches: Rule-based Systems and Symbolic AI

Unit - 2: Growth and Paradigm Shifts in AI

The Era of Expert Systems: MYCIN, DENDRAL, and LISP - AI Winter: Challenges and Decline in Funding - Emergence of Machine Learning: Neural Networks and Backpropagation - Role of Computational Power in AI Growth - Case Studies: Successes and Limitations in Early AI Applications

Unit - 3: Modern AI Techniques and Applications

Machine Learning and Deep Learning: Key Concepts and Frameworks - Natural Language Processing: Evolution from Syntax-Based Models to GPT - Computer Vision: From Feature Detection to Convolutional Neural Networks - Reinforcement Learning: Basics and Notable Milestones (e.g., AlphaGo) - Current Trends: Ethical AI, Generative Models, and AI in Robotics

Unit - 4: Challenges and Societal Impacts of AI

Ethical Concerns: Bias, Privacy, and Accountability - AI and Employment: Automation's Economic and Social Implications - AI in Governance and Policy: Regulation and International Perspectives - Misinformation and Deepfakes: Risks of Generative AI - AI for Social Good: Healthcare, Climate Change, and Accessibility

Unit - 5: Future Directions in AI

General AI (AGI) and the Quest for Super intelligence - Emerging Technologies: Quantum AI and Neuromorphic Computing - Collaborative AI: Human-in-the-Loop Systems - AI in Multidisciplinary Research: Integration with Biology, Physics, and Arts - Vision for the Future: Sustainable AI and Long-Term Impacts

Text Books:

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig
2. "Artificial Intelligence: Structures and Strategies for Solving Complex Problems" by George F. Luger

Reference Books:

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
2. "AI: A Very Short Introduction" by Margaret A. Boden

V SEMESTER	L	T	P	C
	3	-	-	3
20AD5T01 :: MACHINE LEARNING				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Explain the fundamental usage of the concept Machine Learning

CO2: Demonstrate on various regression Technique.

CO3: Analyze the Ensemble Learning Methods.

CO4: Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.

CO5: Discuss the Neural Network Models and Fundamentals concepts of Deep Learning.

UNIT – 1
Introduction:
Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.
Statistical Learning:
Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

UNIT – 2
Supervised Learning(Regression/Classification):
Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

UNIT – 3
Ensemble Learning and Random Forests:
Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

UNIT – 4
Unsupervised Learning Techniques:
Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

UNIT – 5
Neural Networks and Deep Learning:
Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing Tensor Flow 2, Loading and Preprocessing Data with Tensor Flow.

TEXT BOOKS

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019.
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

E – Contents :

1. https://www.ibm.com/topics/machine-learning
2. https://www.geeksforgeeks.org/machine-learning/
3. https://www.coursera.org/learn/machine-learning
4. https://www.w3schools.com/python/python_ml_getting_started.asp

V SEMESTER	L	T	P	C
	3	-	-	3
20CD5T01 :: AUTOMATA THEORY AND COMPILER DESIGN				

COURSE OUTCOMES:

By the end of the course students can able to do:

CO1: Illustrate deterministic and non-deterministic finite state machines

CO2: Employ finite state machines to solve problems in computing using regular expressions

CO3: Demonstrate context free grammars and lexical analyzer of compiler design

CO4: Organize Syntax Analysis by Top down and Bottom up Parsing of compiler design

CO5: Students will understand intermediate-code generation, three-address code, stack allocation, nonlocal data access, and heap management.

UNIT – 1

Introduction to Finite Automata:

Structural Representations, Need of Automata theory, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Nondeterministic Finite Automata:

Formal Definition, an application, Text Search, Finite Automata with Epsilon-Transitions.

Deterministic Finite Automata:

Definition of DFA, How A DFA Process Strings, The language of DFA, Conversion of NFA with €-transitions to NFA without €-transitions. Conversion of NFA to DFA .

UNIT – 2

Regular Expressions:

Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Context-Free Grammars:

Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Trees, Ambiguity in Grammars and Languages.

UNIT – 3

Turing Machines:

Introduction to Turing Machine, Formal Description, Instantaneous description, The language of a Turing machine

Introduction to Compilers:

Phases of the Compiler. Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical- Analyzer Generator Lex,

UNIT – 4

Syntax Analysis:

Top-Down Parsing, Recursive Descent Parsers: LL (K) Parsers. Bottom-Up Parsing: Shift Reduces Parser, LR Parsers: SLR, CLR, LALR.

UNIT – 5

Intermediate-Code Generation:

Variants of Syntax Trees, Three-Address Code

Run-Time Environments:

Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2. Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007
3. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.

Reference Books:

1. Introduction to Automata and Compiler Design, DasaradhRamaiah K, PHI
2. Elements of Theory of Computation, Lewis H.P. &Papadimition C.H., Pearson /PHI
3. Theory of Computation, V. Kulkarni, Oxford University Press, 2013
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014
5. Compiler Construction, Principles and Practice, Kenneth C Louden, Cengage Learning, 2006
6. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
7. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann, 2001.
8. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990

E – Contents :

1. https://nptel.ac.in/courses/106/104/106104028/

V SEMESTER	L	T	P	C
	3	-	-	3
20CS5T01 :: COMPUTER NETWORKS				

Course Outcomes (CO):

At the end of the course, student will be able to

CO1: Differentiate network reference models such as OSI, TCP/IP

CO2: Classify various Data Link Layer protocols such as Error Detection and correction

CO3: Distinguish various MAC sub layer Protocols such as ALOHA, CSMA, CSMA/CD

CO4: Differentiate various Network layer and Transport layer protocols and Its Applications

CO5: Illustrate various application layer protocols such as WWW and HTTP etc.

UNIT – 1

Data Communication:
Components, Data Representation, Data flow (Simplex, Half- duplex and Full-Duplex), Types of connections: Point to Point and Multipoint, Various Categories of Topologies, Categories of Networks, Protocols and Standards, OSI network model, TCP/IP Protocol Suite, Transmission Media (Twisted pair cable, Coaxial cable and Fiber-optic cable).

UNIT – 2

Data Link Layer:
Error Detection and Error Correction -Introduction, Blockcoding: Er- ror Detection, Error Correction, Hamming Distance, Minimum Hamming Distance, Cyclic Codes: Cyclic Redundancy check (CRC), Checksum, Framing, Flow control and Error con- trol.

UNIT – 3

Medium Access Sub Layer:
Random Access protocols – ALOHA, Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA),1-persistent CSMA, Nonpersistent CSMA, p-Persistent CSMA, CSMA/CD, CDMA/CA.

Network Layer:
Logical addressing – IPV4 Addresses: Classful and Classless Addressing, Subnetting, Network Address Translation (NAT), IPV6 Addresses-Structure and Address space, Address Mapping: ARP, RARP, BOOTP and DHCP.

UNIT – 4

Transport Layer:
Process to Process Communication, User Datagram Protocol (UDP), UDP Format, uses of UDP, Transmission Control Protocol (TCP), TCP Services, TCP Fea- tures, TCP Segment, Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT – 5

Application Layer:
Domain Name System (DNS), Domain Name Space, Distribution of Name Space, Remote Logging: TELNET, ELECTRONIC MAIL, SMTP, File Transfer Protocol (FTP), WWW, HTTP.

Text Books:

1. Data Communication and Networking, 5th Edition, Behrouz A. Forouzan, McGrawHill, 2017
2. Computer Networks, 6th Edition, Andrew S. Tanenbaum, Pearson New International Edition, 2021.
3. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India, 2017

Reference Books:

1. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

E – Contents :

1. https://archive.nptel.ac.in/courses/106/105/106105183/
2. https://nptel.ac.in/courses/106105183
3. https://www.geeksforgeeks.org/computer-network-tutorials/

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20AD5E01 :: 1. COMPUTER VISION (PROFESSIONAL ELECTIVE-I)				

Course Outcomes (CO):

At the end of the course, student will be able to

CO1: Identify basic concepts, terminology, theories, models and methods in the field of computer vision

CO2: Describe known principles of feature detection and matching

CO3: Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal

CO4: Suggest a design of a computer vision system for a 3D Reconstruction, Albedos and image based rendering views and depths.

CO5: Develop practical skills through hands-on projects involving 3D scanning, reconstruction, and rendering.

UNIT – 1

Introduction:

Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

UNIT – 2

Feature Detection and Matching:

Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature- Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

UNIT – 3

Structure and Motion:

Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT – 4

Image Stitching:

Motion Models, Global Alignment, Composing And Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and BlurRemoval, image Matting and Compositing, Texture Analysis and Synthesis.

UNIT – 5

3D Reconstruction:

Shape From X, Active Range Finding, Surface Representation,Point-based Representation, Volumetric Representation, Model-based Reconstruction, Re- covering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

Text Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.
3. "Digital Image Processing" by Rafael C. Gonzalez and Richard E.Woods: The first edition of this book was published in 1987, with subsequent editions and updates released over the years. The latest edition as of my last update was in 2017.
4. "Multiple View Geometry in Computer Vision" by Richard Hartley and Andrew Zisserman: The first edition was published in 2000, with a second edition released in 2004.

Reference Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick & Shapiro, “Computer and Robot Vision”, Vol II
3. Gerard Medioni and Sing Bing Kang “Emerging topics in computer vision”

E – Contents :

1. https://www.ibm.com/topics/computer-vision
2. https://www.geeksforgeeks.org/computer-vision/
3. https://aws.amazon.com/computer-vision/

V SEMESTER	L	T	P	C
	3	-	-	3
20AD5E02 :: 2. DATA SCIENCE ON CLOUD (PROFESSIONAL ELECTIVE – I)				

COURSE OUTCOMES:

At the end of the course student are able to

CO1: Describe cloud computing benefits and AWS services for data science.

CO2: Implement data science workflows using AWS tools and AutoML.

CO3: Efficiently ingest, explore, and visualize data on AWS.

CO4: Perform feature engineering and train models using SageMaker.

CO5: Deploy and monitor machine learning models in production on AWS.

UNIT – 1

Introduction to Data Science on AWS:

Benefits of Cloud Computing, Data Science Pipelines and Workflows, MLOps, Amazon AI Services and AutoML, Data Ingestion, Exploration, and Preparation in AWS, Model Training and Tuning, Model Deployment, Streaming Analytics and Machine Learning on AWS, AWS Infrastructure and Custom-Built Hardware, Data Science Use Cases

Automated Machine Learning:

Automated Machine Learning, Track Experiments, Train and Deploy a Text Classifier, Automated Machine Learning

UNIT – 2

Ingest Data into the Cloud:

Data Lakes, Query the Amazon S3 Data Lake with Amazon Athena, Continuously Ingest New Data with AWS Glue Crawler, Build a Lake House with Amazon Redshift Spectrum

Explore the Dataset:

Tools for Exploring Data in AWS, Visualize Our Data Lake with SageMaker Studio, Query Our Data Warehouse, Create Dashboards, Detect Data-Quality Issues and Bias in Our Dataset, Detect Different Types of Drift, Analyze Our Data

UNIT – 3

Prepare the Dataset for Model Training:

Perform Feature Selection and Engineering, Scale Feature Engineering with SageMaker Processing Jobs, Share Features, Ingest and Transform Data with SageMaker Data Wrangler, Track Artifact and Experiment Lineage

Train Your First Model:

SageMaker Infrastructure, Deploy a Pre-Trained BERT Model, Develop a SageMaker Model, Natural Language Processing, BERT Transformer Architecture, Training and Fine Tune a Pre-Trained BERT Model, Create and Launch the Training Script, Evaluate Models, Debug and Profile Model Training, Interpret and Explain Model Predictions

Train and Optimize Models at Scale:

Best Model Hyper-Parameters, Use Warm Start for Additional SageMaker Hyper-Parameter Tuning Jobs, Scale Out with SageMaker Distributed Training

UNIT – 4

Deploy Models to Production:

Real-Time Predictions with SageMaker Endpoints, Auto-Scale SageMaker Endpoints, Strategies to Deploy New and Updated Models, Testing and Comparing New Models, Monitor Model Performance and Detect Drift, Monitor Data Quality, Model Quality , Bias Drift and Feature Attribution Drift of Deployed SageMaker Endpoints, Perform Batch Predictions with SageMaker Batch Transform, Optimize and Manage Models at the Edge, Deploy a PyTorch Model

Pipelines and MLOps:

Machine Learning Operations, Software Pipelines, Machine Learning Pipelines, Pipeline Orchestration with SageMaker Pipelines, Automation with SageMaker Pipelines, More Pipeline Options, Human-in-the-Loop Workflows

UNIT – 5

Streaming Analytics and Machine Learning:

Online Learning Versus Offline Learning, Streaming Applications, Windowed Queries on Streaming Data, Streaming Analytics and Machine Learning on AWS, Classify Real-Time Product Reviews with Amazon Kinesis, AWS Lambda, and Amazon SageMaker, Implement Streaming Data Ingest, Summarize Real-Time Product Reviews, Amazon Kinesis Data Analytics and its Applications, Classify Product Reviews

Secure Data Science on AWS:

Shared Responsibility Model Between AWS and Customers, Applying AWS IAM, Isolating Compute and Network Environments, Securing Amazon S3 Data Access, Encryption at Rest & in Transit, Securing SageMaker Notebook Instances, Studio, Jobs, Models and AWS Lake Formation, Securing Database Credentials, Governance, Auditability, Reduce Cost and Improve Performance

Text Books:

1. Data Science on AWS-Implementing End-to-End, Continuous AI and Machine Learning Pipelines - Chris Fregly & Antje Barth, 2021

Reference Books:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", 1st Edition, Manning Publications, 2016.
2. Learn Amazon SageMaker-Julien Simon, Packt Publishing, 2020.

E – Contents:

1. https://aws.amazon.com/what-is/data-science
2. https://www.javatpoint.com/aws-tutorial
3. https://www.tutorialspoint.com/data-science-and-analytics-with-aws-quicksight
4. https://www.geeksforgeeks.org/aws-tutorial/

V SEMESTER	L	T	P	C
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20AD5E03 :: 3. INTERNET OF THINGS (PROFESSIONAL ELECTIVE – I)				

Course Outcomes: After the completion of this course, students will be able to

CO1: Understand IoT value chain structure (device, data cloud), application areas and technologies involved.

CO2: Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules

CO3: Market forecast for IoT devices with a focus on sensors

CO4: Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

CO5: Understand and Implementation of web-based services on IoT devices

UNIT – 1

Introduction to Signals and systems:

Introduction to Internet of Things- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT – 2

IoT and M2M:

Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP NETOPEER

UNIT – 3

IoT Physical Devices and Endpoints:

Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C) Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors

UNIT – 4

Sensors:

Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor

UNIT – 5

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and communication APIs Web Server – Web server for IoT, Cloud for IoT, Python web application framework designing a RESTful web API

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547 R22 B.Tech. CSE (IOT) Syllabus JNTU Hyderabad.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

E – Contents :

1. https://nptel.ac.in/courses/106105166
2. https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-cs66/

V SEMESTER	L	T	P	C
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20CD5E01 :: 4. ADVANCED DATA STRUCTURES AND ALGORITHMS (PROFESSIONAL ELECTIVE– I)				

CO1: Understand the basic principles and operations of data structures.

CO2: Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.

CO3: Apply the concepts of advanced Trees and Graphs for solving problems effectively.

CO4: Analyze the given scenario and choose appropriate Data Structure for solving problems.

CO5: Analyze and compare the efficiency and effectiveness of different algorithms for disjoint sets and string matching.

UNIT – 1

INTRODUCTION:

Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

UNIT – 2

DIVIDE AND CONQUER:

General method, applications - analysis of binary search, quick sort, merge sort, AND OR Graphs. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem

UNIT – 3

Trees – AVL: Single Rotation,DoubleRotation,B-Trees.

Multi-way Search Trees – 2-3 Trees:

Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree.

Red-Black Trees:

Properties of red-black trees, Rotations, Insertion, Deletion.

UNIT – 4

Graphs Algorithms:

Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

UNIT – 5

Disjoint Sets:

Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm.

String Matching:

The naïve string – matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

Text Books:

1. DataStructuresandAlgorithmAnalysisinC++,MarkAllenWeiss,4thEdition,2014,Pearson.
2. Introduction to Algorithms, Thomas H Cormen,Charles E.Leiserson, RonaldL. Rivest, CliffordStein, 3rd Edition, 2009, The MIT Press.

References Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
2. Advanced Data Structures, Reema Thareja, S.Rama Sree, Oxford University Press, 2018.

E-Resources and other Digital Material

1. http://www.coursera.org/learn/advanced-data-structures
2. http://ocw.mit.edu/6851S12 (MITOPENCOURSEWARE,Massachusetts Institute of Technology)
3. https://nptel.ac.in/courses/106/106/106106133/
4. https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures
5. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

E – Contents :

https://ds1-iiith.vlabs.ac.in/Introduction.html

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20CD5E02 :: 5. CLOUD COMPUTING (PROFESSIONAL ELECTIVE – I)				

Course Outcomes:

Upon completion of the course, it is expected that student will be able to:

CO1: Articulate the main concepts, key technologies, strengths and limitations of cloud computing.

CO2: Learn the key and enabling technologies that help in the development of cloud.

CO3: Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.

CO4: Explain the core issues of cloud computing such as resource management and security.

CO5: Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

UNIT – 1

Introduction:

Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud Characteristics, Elasticity in Cloud – On-Demand Provisioning.

UNIT – 2

Cloud Enabling Technologies:

Service Oriented Architecture, REST and Systems of Systems, Web Services, Publish-Subscribe Model, Basics of Virtualization, Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery.

UNIT – 3

Cloud Architecture, Services and Storage:

Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Public, Private and Hybrid Clouds, IaaS, PaaS, SaaS, Architectural Design Challenges, Cloud Storage, Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers, S3.

UNIT – 4

Resource Management and Security In Cloud:

Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Security Overview, Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT – 5

Cloud Technologies And Advancements:

Hadoop, MapReduce, Virtual Box, Google App Engine, Programming Environment for Google App Engine, Open Stack, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation.

Text Books:

1. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Morgan Kaufmann Publishers, 2013.

2. Cloud Computing: Implementation, Management and Security, Ritting house, John W., and James F. Ransome, CRC Press, 2016.

References:

1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Tata Mcgraw Hill, 2018.

2. Cloud Computing - A Practical Approach, Toby Velte, Anthony Velte, Robert Elsenpeter, Tata McGraw Hill, 2017.

3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice), George Reese, O'Reilly, 2009.

E – Contents :

1. https://www.geeksforgeeks.org/cloud-computing/
2. https://aws.amazon.com/what-is-cloud-computing/
3. https://www.investopedia.com/terms/c/cloud-computing.asp

V SEMESTER	L	T	P	C
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20AM5E01 :: 6. PRINCIPLES OF SOFTWARE ENGINEERING (PROFESSIONAL ELECTIVE– I)				

Course Outcomes (CO): At the end of the course, student will be able to

CO1: Identify, formulate the various software engineering concepts

CO2: Analyze different software development process models.

CO3: Analyze and specify software requirements with various stake-holders of a software development project

CO4: Apply systematic procedure for software design and deployment

CO5: Compare and contrast the various testing methods and art of debugging

UNIT – 1

Software Engineering:

The nature of Software: Define software (Software Characteristics), Software Application Domains, Legacy software, Software Engineering: Definition, Layered Technology, SOFTWARE PROCESS: Generic Process framework activities, Umbrella activities, software engineering Practice: the essence of Practice, general principles, Software Myths and Reality, Generic Process model, Capability, Maturity Model Integration (CMMI).

UNIT – 2

PROCESS MODELS:

Process Assessment and improvement. Prescriptive Process models: Waterfall Model, Incremental Process Model, Evolutionary Process Models: Prototyping, Spiral model, The Unified Process .Personal and Team process models: Personal software process (PSP), Team software process (TSP), Product and Process.

Agile Process:

Agility and the cost of change, Agility Principles, the politics of agile devel opment, Human Factors.

UNIT – 3

REQUIREMENTS ANALYSIS AND SPECIFICATION:

Functional Requirements, Non- Functional Requirements, Software Requirements Document (Software Requirements Specification SRS), Requirements Specification, Requirements Engineering, Establishing the Ground work, Eliciting Requirements (elicitation), Developing Use cases, Validating Requirements.

Requirements Management:

Requirements Planning, Requirements Change management.

UNIT – 4

SOFTWARE DESIGN:

Design process, Design concepts: Abstraction, Architecture, Pat- terns, Separation of Concerns, Modularity, Information hiding, Functional independence, Refinement, Aspects, refactoring, Object oriented design concepts, Design classes.

The Design Model:

Data Design Elements, Architectural Design elements, Interface De- sign Elements, Component-Level Design Elements, Deployment-Level Design Elements.

Designing Class Based Components: Basic Design Principles, Component-Level Design guidelines, Cohesion and coupling. User Interface Design: The Golden Rules.

UNIT – 5

TESTING:

Elements of software quality assurance, SQA Tasks and Goals. The strategies for Conventional Strategies: Unit Testing – Integration Testing. Test Strategies for Object-Oriented Software, Software testing fundamentals, white box testing- Basis path testing: Flow graph Notation, independent Program paths, Deriving test cases, Graph Matrices. control structure testing.

Black box testing: Graph Based Testing Methods, Equivalence Partitioning, Boundary value Analysis. Validation Testing, System Testing.

Art of Debugging:

The Debugging process, Psychological Considerations, Debugging Strategies, Correcting the error.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition,McGraw-Hill international Edition, 2014.
2. Software Engineering, IanSommerville,10th Edition, Pearson Education Asia, 2016.

Reference Books:

1. Software Engineering, Pankaj Jalote, APrecise Approach",Wiley India, 2010.
2. Systems Analysis and Design-Shely Cashman Rosenblatt,9th Edition, Thomson pub-lications, 2016.
3. Software Project Management, Bob Hughes, Mike Cotterell and Rajib Mall, Fifth Edi-tion, Tata McGraw Hill, New Delhi, 2012.

E-Contents:

https://nptel.ac.in/courses/106101061/

V SEMESTER	L	T	P	C
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20AD5L01 :: MACHINE LEARNING LAB				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Implement procedures for the machine learning algorithms
CO2: Design and Develop Python programs for various Learning algorithms
CO3: Apply appropriate data sets to the Machine Learning algorithms
CO4: Develop Machine Learning algorithms to solve real world problems.
CO5: Develop proficiency in handling real-world datasets for training and testing machine learning models.

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1: Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2: For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3: Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4: Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation

Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7: Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8: Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-10: Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13: Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14: Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15: Write a program to Implement Principle Component Analysis

E – Contents:

1. https://github.com/AbhishekMali21/VTU-CSE-LAB-SOLUTIONS/blob/master/7th%20SEM/MACHINE%20LEARNING%20LABORATORY/1-Find-S%20Algorithm/LAB%201.ipynb
2. https://deepakdvallur.weebly.com/uploads/8/9/7/5/89758787/
3. https://www.bietsikar.ac.in/documents/9699457926MACHINE%20LEARNING%20LAB.pdf

V SEMESTER	L	T	P	C
	-	-	3	1.5
20CS5L01 :: COMPUTER NETWORKS LAB				

Course Outcomes (CO): At the end of the course, student will be able to

CO1: Study and practicing various networking commands.

CO2: Study and implementing different network cables

CO3: Understand various networking commands in packet traces software

CO4: Configure a network using packet tracer software

CO5: Implement and configuring various routing algorithms using packet tracer.

LIST OF PROGRAMS:

1. Study of Networking Commands (Ping, Tracert, TELNET, nslookup, netstat, ARP) and Network Configuration Files.
2. Study of different types of network cables and practically implement the cross wired cable and straight through cable using crimping tool
3. Implementing Data link layer farming methods such as bit stuffing and character stuffing.
4. Connect the computers in LAN network
5. Study and practice basic network command and network configuration commands using packet tracer
6. Performing initial Switch and Router configuration using packet tracer
7. Configure a network topology using packet tracer software using two different networks
8. Configure a network topology using RIP protocol
9. Configure a network topology using link state vector routing protocol
10. Observing static routing and dynamic routing using packet tracer
11. Static NAT configuration using cisco packet tracer

E – Contents:

1. https://www.geeksforgeeks.org/network-configuration-trouble-shooting-commands-linux/
2. https://www.slideshare.net/slideshow/19-24-cn-practicals/250468951
3. https://engineering.ju.edu.jo/ar/Arabic/Laboratories/CPE_0907528_networklab_Sep_2016_Fall.pdf

V SEMESTER	L	T	P	C
	1	0	2	2
20HS5S01 :: ADVANCED COMMUNICATION SKILLS LAB				

Course Outcomes (CO): At the end of the course, student will be able to

CO1: Gather ideas and organize information relevantly and coherently.

CO2: Participate in group discussions and face interviews with confidence.

CO3: Write Resume with covering letter.

CO4: Make oral presentations and public speaking.

CO5: Take part in social and professional communication.

The following course content is prescribed for the Advanced English CommunicationSkills Lab:

UNIT – 1 Communication Skills

- Introduce Yourself
- JAM
- J2M

Identifying one's career objective, projecting strengths and skills, organization of ideas within given time.

UNIT – 2 Interaction Skills

- Body Language
- Role- Plays

Students start a conversation - Respond appropriately and relevantly in different situations with right body language.

UNIT – 3 Oral Skills

- Presentations
- Public Speaking

Planning preparation and presentation - organization of ideas with clarity, coherence andstyle.

UNIT – 4 Writing Skills

- Covering Letter
- Resume Writing

To communicate the ideas relevantly and coherently in writing.

UNIT – 5 Team Work Skills

- Group Discussion

Dynamics of Group Discussion - Modulation of voice, Body language, relevance, fluency and coherence.

UNIT – 6 Interview Skills

Pre-interview planning, opening strategies, answering strategies, interview through tele and video conference.

Reference Books:

1. Ashraf Rizvi- Effective Technical Communication - McGraw Hill Education- 2017.
2. Madhavi Apte - A Course in English Communication – Prentice - Hall of India- 2007.
3. Dr. Shalini Verma - Body Language – Your Success Mantra- S. Chand- 2006.
4. Sunita Mishra C. Murali Krishna- Communication Skills for Engineers - PearsonEducation - 2007.

E – Contents :

1. https://www.geethanjaliinstitutions.com/engineering/labmanuals/downloads/cse/aecs%20lab.pdf
2. https://www.atri.edu.in/images/pdf/departments/ACS%20LAB%20MANUAL.pdf
3. https://mlrit.ac.in/wp-content/uploads/files/CSE/MLR-17/ADVANCED%20ENGISH%20COMMUNICATION%20SKILLS%20LAB.pdf

V SEMESTER	L	T	P	C
	2	-	-	-
20BM5M01 :: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE				

CO1: Analyze Indigenous Knowledge (IK), highlighting its unique characteristics and contributions.

CO2: Evaluate the role of traditional knowledge in the global economy and its potential for sustainable development.

CO3: Evaluate the implications of the Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act) on traditional knowledge preservation.

CO4: Define key legal concepts and mechanisms used to protect traditional knowledge, such as sui generis systems.

CO5: Explore the contributions of traditional knowledge to agriculture, emphasizing sustainable practices and food security.

UNIT – 1

Introduction to traditional knowledge:

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT – 2

Protection of traditional knowledge:

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT – 3

Legal framework and TK:

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT – 4

Traditional knowledge and intellectual property:

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT – 5

Traditional Knowledge in Different Sectors:

Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Text books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

Web Links:

1. https://www.studocu.com/in/document/institute-of-aeronautical-engineering/electrical-machines/essence-of-indian-traditional-knowledge-lecture-notes/41532531
2. http://nptel.ac.in/courses/121106003/

V SEMESTER	L	T	P	C
	3	-	-	4
20AD5M01 : FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS				

Course Objectives (COs):

1. Understand the fundamental concepts of data science and its role in solving real-world problems.
2. Learn data manipulation, cleaning, and visualization techniques for exploratory data analysis.
3. Explore statistical methods and machine learning algorithms for deriving insights from data.
4. Gain proficiency in programming languages and tools commonly used in data science.
5. Apply data science methods to solve domain-specific problems through hands-on projects.

Course Outcomes (COs):

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

CO1: Describe the core principles of data science and the data lifecycle.
CO2: Perform data preprocessing and analysis using statistical methods and tools.
CO3: Design and evaluate predictive models using machine learning techniques.
CO4: Visualize data effectively to communicate insights.
CO5: Solve practical problems in various domains using data-driven approaches.

Unit 1: Introduction to Data Science

Overview of Data Science, The Data Science Process: Problem formulation, data collection, preparation, analysis, and communication, Types of Data, Tools and Technologies, Ethics and Privacy in Data Science: Bias, fairness, and security concerns.

Unit 2: Data Preprocessing and Exploration

Data Collection, Data Preprocessing, Exploratory Data Analysis (EDA), Feature Engineering: Scaling, encoding, and dimensionality reduction techniques (PCA), Tools for EDA

Unit 3: Statistical Foundations and Machine Learning Basics

Probability and Statistics for Data Science, Introduction to Machine Learning: Supervised vs. unsupervised learning, overfitting, and model evaluation, Linear regression, decision trees, clustering, and classification, Performance Metrics, Tools.

Unit 4: Data Visualization and Communication

Principles of Effective Data Visualization: Gestalt principles, chart selection, and storytelling with data, Visualization Tools, Interactive Dashboards, Case Studies, Communicating Insights

Unit 5: Advanced Topics and Applications

Time Series Analysis, Text Analytics, Big Data and Cloud Analytics, Domain-Specific Applications: Case studies in healthcare, finance, marketing, and IoT.

Textbooks

1. **"Python for Data Analysis"** by Wes McKinney O'Reilly Media
2. **"Data Science from Scratch: First Principles with Python"** by Joel Grus O'Reilly Media

Reference Books

1. **"Introduction to Statistical Learning"** by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer
2. **"Data Science for Business"** by Foster Provost and Tom Fawcett ,O'Reilly Media

E-Contents

1. https://www.kaggle.com/learn
2. https://grow.google/certificates/data-analytics/
3. https://scikit-learn.org/stable/documentation.html
4. https://www.coursera.org/specializations/data-science-python

VI SEMESTER	L	T	P	C
	3	-	-	3
20AM6T01 :: DEEP LEARNING				

COURSE OUTCOMES

After completion of course, students would be able to:

CO1: Demonstrate the basic concepts fundamental learning techniques and layers

CO2: Discuss the Neural Network training, various random models.

CO3 : Explain different types of deep learning network models

CO4: Classify the Probabilistic Neural Networks

CO5: Implement tools on Deep Learning techniques

UNIT-I:

Introduction: Fundamentals of Deep Learning-Artificial Intelligence, Machine Learning and Deep Learning, Brief history of machine Learning, Why Deep learning. Feed forward neural network-Artificial Neural Network, activation function, multi-layer neural network

UNIT-II:

Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection and optimization. Deep Neural Networks**:** Difficulty of training deep neural networks, Greedy layer wise training.

UNIT-III:

Convolution neural networks (CNNs): Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG Training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNN

UNIT-IV:

Introduction to Recurrent Neural Networks: Introduction to RNNs, Unfolded RNNs, Seq2Seq RNNs, Long Short Term Memory Networks, RNN applications, Gated Recurrent Unit Networks

UNIT-V:

Applications: Object recognition, sparse coding, computer vision, natural language processing. Video Analytics

Textbooks:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016
2. Francois Chollet, Deep Learning with Python, Manning Publications,2018

Reference Textbooks:

1. DouweOsinga, ,Shroff Publishers “Deep learning Cook Book, Practical recipes to get started Quickly”, O’Reilly, 2019
2. Josh Patterson and Adam Gibson “Deep learning: A practitioner's approach, , First Edition, 2017, O'Reilly Media
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
2. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

Web Link:

Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

VI SEMESTER	L	T	P	C
	3	-	-	3
20CD6T01 :: DATA VISUALIZATION TECHNIQUES				

Course Outcomes: At the end of the course, student will be able to

CO1: Understand the Visualization concepts

CO2: Classify the visualization systems

CO3: Create visualization of groups

CO4: Visualization of complex data

CO5: Apply new techniques in data visualization

UNIT – 1

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design ofvisualization applications.

UNIT – 2

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT – 3

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT – 4

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations

UNIT – 5

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Text Books:

1. WARD, GRINSTEIN, KEIM,. Interactive Data Visualization: Foundations, Techniques, and Applications. Natick:AKPeters, Ltd.
2. E.Tufte, The Visual Display of Quantitative Information, GraphicsPress.

Reference Text Books:

1. Beautiful Visualization, Looking at Data Through the Eyes of Experts by Julie Steele, Noah Iliinsky.
2. The Accidental Analyst: Show Your Data Who's Boss by Eileen and Stephen McDaniel.

E-Resources

1. https://nptel.ac.in/courses/111106415
2. https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/?v=c86ee0d9d7ed

VI SEMESTER	L	T	P	C
	3	-	-	3
20AD6T01 :: BIG DATA ANALYTICS				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Demonstrate knowledge of Big Data, Data Analytics, challenges and their solutions in Big Data.

CO2: Analyze Hadoop Framework and eco systems.

CO3: Compare and work on NewSQL environment and MongoDB and Cassandra.

CO4: Apply the Big Data using Map-reduce programming in Both Hadoop and Spark framework.

CO5: Analyze the data Analytics algorithms in Spark

UNIT – 1

Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured - Sources of data. Big Data Evolution - Definition of big data Characteristics and Need of big data - Challenges of big data - Big data analytics, Overview of business intelligence.

UNIT – 2

Big data technologies and Databases: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop – Comparison with other system SQL and RDBMS- Hadoop Components – Architecture -Hadoop 1 vs Hadoop 2.

UNIT – 3

MapReduce and YARN framework: Introduction to MapReduce , Processing data with Hadoop using MapReduce, Introduction to YARN, Architecture, Managing Resources and Applications with Hadoop YARN. Big data technologies and Databases: NoSQL: Introduction to NoSQL - Features and Types Advantages & Disadvantages - Application of NoSQL.

UNIT – 4

New SQL: Overview of New SQL - Comparing SQL, NoSQL and NewSQL. Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.

UNIT – 5

(Big Data Frame Works for Analytics) Hadoop Frame Work: Map Reduce Programming: I/O formats, Map side join-Reduce Side Join-Secondary Sorting-Pipelining MapReduce jobs Spark Frame Work: Introduction to Apache spark-How spark works, Programming with RDDs: Create RDD spark Operations-Data Frame.

TEXT BOOKS:

1. Seema Acharya and Subhashini Chellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd., 2016.

2. Mike Frampton, “Mastering Apache Spark”, Packt Publishing, 2015.

REFERENCE BOOKS:

1. Tom White, “Hadoop: The Definitive Guide”, O‟Reilly, 4th Edition, 2015.

2. Mohammed Guller, “Big Data Analytics with Spark”, Apress, 2015

3. Donald Miner, Adam Shook, “Map Reduce Design Pattern”, O‟Reilly, 2012.

E – Contents :

1. https://www.ibm.com/topics/big-data-analytics
2. https://www.geeksforgeeks.org/what-is-big-data-analytics/
3. https://azure.microsoft.com/en-in/resources/cloud-computing-dictionary/what-is-big-data-analytics
4. https://www.bornfight.com/blog/7-real-world-examples-of-how-brands-are-using-big-data-analytics/

VI SEMESTER	L	T	P	C
	3	-	-	3
20AD6E01 :: 1. DIGITAL IMAGE PROCESSING (PROFESSIONAL ELECTIVE – II)				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Exploration of the limitations of the computational methods on digital images.

CO2: Expected to implement the spatial and frequency domain image transforms on.

CO3: enhancement and restoration of images. Elaborate understanding on image enhancement techniques.

CO4: Expected to define the need for compression and evaluate the basic compression algorithms.

CO5: Understand and apply various image compression techniques, including error-free, lossy, predictive coding, and JPEG 2000 standards.

UNIT-1:

Digital Image Fundamentals & Image Transforms:

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT-2:

Image Enhancement (Spatial Domain):

Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain

UNIT-3:

Image Restoration:

Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-4:

Image Segmentation:

Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

Morphological Image Processing:

Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT-5:

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXT BOOKS:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 4th Edition, Pearson, 2018
2. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008.
3. Digital Image Processing – S Jayaraman, S Esakkirajan, T Veerakumar - McGRAW HILL EDUCATION, 2010.

Reference Books:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, MC GRAW HILL EDUCATION, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd edition.

E – Contents :

1. https://www.geeksforgeeks.org/digital-image-processing-basics/
2. https://www.javatpoint.com/digital-image-processing-tutorial
3. https://www.v7labs.com/blog/image-processing-guide
4. https://www.tutorialspoint.com/dip/index.htm

VI SEMESTER	L	T	P	C
	3	-	-	3
20AD6E02 :: 2. OBJECT ORIENTED ANALYSIS AND DESIGN (PROFESSIONAL ELECTIVE - II)				

COURSE OUTCOMES:

After finishing this course student will be able to:

CO1: Analyze the nature of complex system and its solutions.

CO2: Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships

CO3: Analyze & Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.

CO4: Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.

CO5: Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

UNIT – 1

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems.

Case Study: System Architecture: Satellite-Based Navigation.

UNIT – 2

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

Case Study: Control System: Traffic Management.

UNIT – 3

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Case Study: AI: Cryptanalysis.

UNIT – 4

Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams.

Case Study: Web Application: Vacation Tracking System.

UNIT – 5

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams **Case Study:** Weather Forecasting

Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , ―Object- Oriented Analysis and Design with Applications‖, 3rd edition, 2013, PEARSON.

2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide,Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.

2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.

3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.

4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

E – Contents :

1. https://www.geeksforgeeks.org/object-oriented-analysis-and-design/
2. https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
3. https://kanchiuniv.ac.in/coursematerials/OOADCSE.pdf
4. https://www.coursera.org/learn/object-oriented-design

VI SEMESTER	L	T	P	C
	3	-	-	3
20AD6E03 :: 3. GEOGRAPHICAL INFORMATION SYSTEM (PROFESSIONAL ELECTIVE – II)				

COURSE OUTCOMES:

After the completion of this course, students will be able to
CO1: Understand the basic concepts in GIS and Explore mapped data
CO2: Understands to relate GIS with remote sensing technologies
CO3: Acquires basic knowledge in analyzing of spatial data, using GIS analysis tools.
CO4: Understands in designing and implementation of Vector and Raster Data Structures
CO5: Understand in Create maps, images and apps to communicate spatial data in a meaningful way to others.

UNIT – 1

Introduction:

Introduction to Geographical Information Systems: Introduction maps and spatial information. Basic Components of GIS, A Brief-History of GIS and GIS Software's products. Elements of GIS, Application of GIS.

UNIT – 2

Data Files and Geo-Data bases):

Data Files and Data bases- Data Types – Non-Spatial Data – Nominal, Ordinal, interval, ratio-Spatial Data – Points, Lines and Polygons / Area –File Types – Simple lists, Ordered Sequential Files – Indexed Files – Data Base – Functions, Data base structures – Hierarchical, Network, Relational

UNIT – 3

Raster Data structures and Data Model :

Elements of the Raster Data Model, Satellite Image Types-IRS series, Landsat , SPOT, GeoEye and Digital Globe , Raster Data Structure - Cell-by-Cell Encoding, Run-Length Encoding and Quadtree, Application of Raster Data Model.

UNIT – 4

Vector Data Structure and Data Model:

Creating a vector – Arcs, Storing area – Data Base Creation – Digitizer, On Screen Digitizing – Topology – Euler Equation, Topological Consistency, Topological Errors, Error identification, Topological Editing, Line weeding, Node matching, Digital Line Graph, Data Classification Analysis.

UNIT – 5

Continuous Surface Representation and GPS:

Digital Elevation Models – Elevation data capture, Interpolation, DEM representation – Altitude matrix, TIN structure – DEM interpretation, Scale. Global Positioning System (GPS) -Elements – space segment, user segment and control segment; Observation principles; phase measurement techniques; determining ortho metric heights Applications-Trackers, Open street mapping.

TEXT BOOKS

1. Longley, Paul A., Michael F. Goodchild, David J. Maguire, and David W. Rhind. "Geographic information systems and science". John Wiley & Sons, 2005.
2. Miller, Harvey J., and Shih-Lung Shaw. Geographic information systems for transportation: principles and applications. Oxford University Press on Demand, 2001.

Reference Books

1. Longley, Paul A., Michael F. Goodchild, David J. Maguire, and David W. Rhind. "Geographic information systems and science". John Wiley & Sons, 2005.
2. Miller, Harvey J., and Shih-Lung Shaw. Geographic information systems for transportation: principles and applications. Oxford University Press on Demand, 2001.
3. Martin, David. Geographic information systems: socioeconomic applications. Routledge, 2nd edition, 2003.
4. JagadeeswaraRaoPeddada. "Silt Deposition in Meghadrigedda Reservoir, India- A Spatial Study", LAP Lambert Academic Publishing, First Edition, 2015.
5. Yongwan Chun. "Spatial Statistics and Geostatistics: Theory and Applications for Geographic Information Science and Technology." SAGE Publications Ltd; 1st edition, 2013.
6. JianGuo Liu, Philippa J. Mason. "Image Processing and GIS for Remote Sensing: Techniques and Applications, 2nd Edition, Wiley-Blackwell, 2016.

E – Contents :

1. https://education.nationalgeographic.org/resource/geographic-information-system-gis/
2. https://www.manage.gov.in/studymaterial/GIS.pdf
3. https://www.geeksforgeeks.org/geographical-information-system-gis-and-its-components/

VI SEMESTER	L	T	P	C
	3	-	-	3
20AM6E02 :: 4. ETHICS OF ARTIFICIAL INTELLIGENCE (PROFESSIONAL ELECTIVE – II)				

COURSE OUTCOMES:

CO1: Understand the ethical issues in the development of AI agents.

CO2: Learn the ethical considerations of AI with perspectives on ethical values.

CO3: Apply the ethical policies in AI based applications and Robot development.

CO4: To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.

CO5: This study will help to overcome the evil genesis in the concepts of AI.

UNIT – 1

INTRODUCTION TO ETHICS OF AI:

What is AI, Definition, How does AI work, How is AI different from other technologies, Ethics in Organization, IT , Software Ethics, Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities.

UNIT – 2

FRAMEWORK AND MODELS:

AI Frame works : What is a Framework, AI Governance by Human-right Centred design, Role of Professional norms, Teaching machines to be moral ,What is An AI Model , Deploy an AI Model , The Values of AI Models in Business , Understand Popular AI Models.

UNIT – 3

CONCEPTS AND ISSUES:

Accountability in Computer Systems, Transparency, Data Protection ,Responsibility and AI. Race and Gender, AI as a moral right-holder .Cost to innovation .Harm to physical integrity .Lack of access to public services .Lack of trust, “Awakening” of AI, Security problems, Lack of quality data, Disappearance of jobs.

UNIT – 4

PERSPECTIVES AND APPROACHES:

Perspectives: Deontological Ethics, Consequentialist Ethics, VirtueEthics , Feminist ethics, Human-centred AI, Explainable AI.

Approaches: Technical approaches ,Societal approaches ,philosophical approaches.

UNIT – 5

CASES AND APPLICATION:

Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics.

TEXT BOOK:

1. Dr. S.Suresh Kumar, Dr.B.Ramakrishna , M.Ramabhadra Rao ,"Principles of Artificial Intelligence Ethics", PND Publisher-2022.

REFERENCES

1. Paula Boddington, "Towards a Code of Ethics for Artificial Intelligence", Springer, 2017

2. Markus D. Dubber, Frank Pasquale, Sunit Das, "The Oxford Handbook of Ethics of AI", Oxford University Press Edited book, 2020.

E – Contents :

1. https://www.coursera.org/articles/ai-ethics
2. https://www.ibm.com/topics/ai-ethics
3. https://intelligence.org/files/EthicsofAI.pdf

VI SEMESTER	L	T	P	C
	3	-	-	3
20CD6E01 :: 5. COMPUTER GRAPHICS (PROFESSIONAL ELECTIVE – II)				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Describe different input and output devices and algorithms for drawing line, circle, polygon

CO2: Analyze 2-D graphics along with transformation techniques and clipping.

CO3: Analyze 3-D graphics along with transformation techniques and space curves.

CO4: Use the principles and commonly used paradigms and techniques of computer graphics

CO5: Write basic graphics application programs including animation.

UNIT – 1

INTRODUCTION:

Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

OUTPUT PRIMITIVES:

Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

UNIT – 2

2-D GEOMETRICAL TRANSFORMATIONS:

Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates

2-D VIEWING :

The viewing pipe-line, viewing coordinat4 reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, SutherlandHodgeman polygon clipping algorithm

UNIT – 3

3-D OBJECT REPRESENTATION:

spline representation, Hermite curve, Bezier curve and B-spline curve, Polygon surfaces, quadric surfaces, , Solid modeling Schalars – wire frame, CSG, B-rep. Bezier and B-spline surfaces, Basic illumination models, shading algorithms

UNIT – 4

3-D GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformation and composite transformations. Visible surface detection methods: Classification, back-face detection, depthbuffer, scan-line, depth sorting

UNIT – 5

COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification.

TEXT BOOKS

1. Computer Graphics C version/ Donald Hearn and M. Pauline Baker/Pearson/PHI
2. Computer Graphics Principles & practice-second edition in C/ Foley, VanDam, Feiner and Hughes/Pearson Education

Reference Books:

1. Computer Graphics Second edition/ Zhigand xiang, Roy Plastock, Schaum's outlines/Tata Mc-Graw hill edition.
2. Procedural elements for Computer Graphics/David F Rogers/Tata Mc Graw hill, 2nd edition.
3. Principles of Interactive Computer Graphics/ Neuman and Sproul/TMH.
4. Computer Graphics/ Steven Harrington/TMH Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

E – Contents :

1. https://www.coursera.org/articles/computer-graphics
2. https://www.javatpoint.com/computer-graphics-tutorial
3. https://www.geeksforgeeks.org/introduction-to-computer-graphics/
4. https://www.tutorialspoint.com/computer_graphics/computer_graphics_quick_guide.htm

VI SEMESTER	L	T	P	C
	3	-	-	3
20CD6E02 :: 6. OPERATIONS RESEACH (PROFESSIONAL ELECTIVE – II)				

COURSE OUTCOMES:

After the completion of this course, students will be able to

CO1: Formulate and solve mathematical model (linear programming problem) for a physical situations like production and distribution of goods.
CO2 Apply the concept of simplex method and its extensions to dual simplex algorithm.
CO3: Solve the problem of transporting the products from origins to destinations with least transportation cost.
CO4: Convert and solve the practical situations of sequencing and replacement problem.
CO5: Identify the resources required for a project and generate a plan and work schedule

UNIT – 1
Development:

Definition– characteristics and phases – types of operation research models – applications.

Linear Programming Problem:
Introduction to OR, Linear Programming, Mathematical Formulation of the problem, Graphical Solution. General LPP, Canonical and standard form of LPP. Simplex Method

UNIT – 2
Transportation Problem:

Introduction, LP formulation of Transportation Problem, The Transportation Table, Solution of Transportation problem, Finding IBFS: North-West Corner rule, Least –cost Method and VAM, Test for Optimality.

Assignment Problem:
Introduction, Mathematical Formulation of the Problem, Hungarian Assignment Method only, Special Cases in Assignment Problems

UNIT – 3
Sequencing Problem:

Introduction, Problem of Sequencing, Processing n jobs through two machines. Processing n jobs through k machines, Processing 2 jobs through two machines.

Traveling Salesman:
formulation of the Traveling Salesman Problem.

UNIT – 4
Queuing Theory:
Introduction, Queuing system, elements of Queuing system Operating characteristics of a Queuing system, Classification of queuing models: Model-I [M/M/1:∞ / FIFO], Model-III [M/M/1: N/FIFO].

UNIT – 5
Game Theory:

Introduction, Two Person Zero sum games, Maximin - Minimax principle, Games without saddle points-mixed strategies, Graphical solution of 2Xn, mX2 games, and Dominance property, P-system, S-system, Q-system and Ss-system

Project Management PERT & CPM:
Introduction, construction of networks, calculation of EST, EFT, LST, LFT, and total elapsed time.

TEXT BOOKS

1. Operations Research A.M.Natarajan, P. Balasubramani, A. Tamilarasi Pearson Education.

Reference Books

1. Operations Research / S.D.Sharma-KedarnathRamnath(JNTU)
2. Operations Research / R.Pannerselvam / PHI Publications.
3. Operation Research /J.K.Sharma/MacMilan.
4. Operation Research /Premkumar Gupta, D.S.Hira / S.Chand
5. Operation Research An Introduction / Taha / Pearson
6. Operation Research / KanthiSwarup, P.K Gupta, Man Mohan / Sultan Chand & sons

E – Contents :

1. https://pubsonline.informs.org/journal/opre
2. https://www.britannica.com/topic/operations-research
3. https://research.google/teams/operations-research/
4. https://link.springer.com/journal/12351

VI SEMESTER	L	T	P	C
	3	-	-	3
20AD6L01 :: BIG DATA ANALYTICS LAB				

COURSE OBJECTIVES:

The objectives of this course are,

CO1: To implement MapReduce programs for processing big data.

CO2: Experiment MapReduce in Hadoop frameworks

CO3: Implement MapReduce programs in variety applications

CO4: Explore MapReduce support for debugging

CO5: To realize storage of big data using MongoDB.

List of Experiments:

1. Install Apache Hadoop.

2. Develop a MapReduce program to calculate the frequency of a given word in agiven file.

3. Develop a MapReduce program to find the maximum temperature in each year.

4. Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.

5. Implement word count / frequency programs using MapReduce.

6. Develop a MapReduce program to find the grades of student's.

7. Develop a program to calculate the maximum recorded temperature by year wise for the weather dataset in Pig Latin.

8. Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB.

9. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.

10. Implement an application that stores big data in MongoDB / Pig using Hadoop / R.

E – Contents:

1. https://hadoop.apache.org/docs/current/hadoop-mapreduce-client/hadoop-mapreduce-client-core/MapReduceTutorial.html
2. https://www.mongodb.com/docs/manual/crud/
3. https://www.mongodb.com/resources/basics/big-data-explained
4. https://www.mongodb.com/docs/manual/aggregation/

VI SEMESTER	L	T	P	C
	3	-	-	3
20CD6L01:: DATA VISUALIZATION LAB				

Course Outcomes: At the end of the Course the student shall be able to

CO1: Explain principles of visual perception

CO2: Apply core skills for visual analysis

CO3: Apply visualization techniques for various data analysis tasks

CO4: Develop visualizations using multiple technologies

CO5: Design informaton dashboard

(Any 12 experiments from the following to be performed)

LIST OF EXPERIMENTS:

1. Develop the Different basic Graphical Shapes using HTML5 CANVAS
2. Develop the Different basic Graphical Shapes using HTML5 SVG
3. Develop JavaScript code that receives input from user and gets in action based on user input using HTML5 and JavaScript
4. Develop the simple bar chart using HTML5 CANVAS
5. Read the data.txt file and draw Data Table and draw Simple Bar Chart
6. Read the data.csv file and draw Data Table and draw Column Bar Chart
7. Read the data XML file and draw Data Table and draw Simple Chart
8. Read JSON Data and draw Data Table and draw Simple Chart
9. Develop Following Program using HTML5 and D3.js and Canvas.js (Consider health care domain data)
    a. Showing the Data as a column chart (simple)
    b. Showing the Data as a stacked column chart
    c. Showing the Data as a column chart for four age group
10. Develop Following Program Using HTML5 and D3.js and Canvas.js
    a. Showing the data as a Line Chart (single, fewer and multiple lines)
    b. Showing the data as a Pie Chart (single and multiple pie)
    c. Showing the data as a Bar Chart (simple and multiple)
11. Develop Following Program using HTML5 and Google Charts API and Map API (Consider Market Analysis Data)
    a. Using Google Charts API Basics draw charts like a Bar Chart
    b. Using Google Charts API Basics draw charts like a Line Chart
12. Develop Following Program Using HTML5 and Google Charts API and Map API (Consider Student Data)
    a. Draw Pie Chart
    b. Draw Donut Chart
13. Develop Following Program using HTML5 and Google Charts API and Map API
    a. Draw Candle Chart
    b. Draw other types of charts
14. Using Google API read JSON file and create Google Map.
15. Build interactive Dashboard (Case study to be performed in 2 weeks considering a real time problem)

REFERENCES:

1. Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery JavaScript and jQuery for Data Analysis and Visualization, 2014.
2. Stuart J.Russel and Peter Norvig, Artificial Intelligence, A Modern Approach, Fourth Edition, Pearson, 2020.
3. Martin C.Brown (Author), Python: The Complete Reference, McGraw Hill Education, Fourth Edition, 2018.
4. R. Nageswara Rao, Core Python Programming, Dreamtech Press India Pvt. Ltd, 2018.

E – Contents :

1. https://onlinecourses.nptel.ac.in/noc19 cs40/preview
2. http://code.google.com/apis/chart/

VI SEMESTER	L	T	P	C
	-	-	3	1.5
20AM6L01 :: DEEP LEARNING LAB				

COURSEOUTCOMES:

At the end of the course, the student will be able to,

CO1: Understand the implementation procedures for the Deep Learning algorithms.

CO2: Design python programs for various learning algorithms.

CO3: Apply appropriate data sets to the Deep Learning algorithms.

CO4: Identify and apply Deep Learning algorithms to solve real world problems.

CO5: Apply various Deep Learning algorithms for various applications.

LIST OF EXPERIMENTS:

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
2. Implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
3. Implement a single neural network and test for different logic gates.
4 Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets
5.Implement Lasso regression model to predict house price
6.Implement Ridge regression model to predict house price
7. Develop simple Neural Network Example with Tensorflow
8. Develop a small application with keras
9. Implement a model to classify handwritten Digits with Tensorflow
10 .Implement a LSTM model to stock market prediction
11. Implement Convolution Neural Network
12. Implement Alex net model
13. Implement CNN model for image classification

VI SEMESTER	L	T	P	C
	1	-	3	2
20CD6S01 :: NOSQL				

Course Outcomes:

CO1: Installing and configuring mongoDB in windows

CO2:.Perform all database operations using mongoDB

CO3: Develop simple applications using MongoDB with both Java and PHP.

CO4: Understand and apply projection in MongoDB to retrieve specific fields from documents

CO5: Ability to query all documents in JSON format and perform queries based on specific criteria.

List of Experiments:

1. MongoDB installation and configuration in windows.
2. Demonstrate how to create and drop a database in MongoDB.
3. Creating the Collection in MongoDB on the fly
4. Creating collection with options before inserting the documents and drop the collection created.
5. MongoDB insert document a. Insert single document b. Insert multiple documents in collection
6. Querying all the documents in json format and Querying based on the criteria.
7. MongoDB update document
   a. Using update() method.
   b. Using save() method.
8. MongoDB delete document from a collection.
   a. Using remove() method.
   b. Remove only one document matching your criteria
   c. Remove all documents
9. MongoDB Projection
10. limit() ,skip(), sort() methods in MongoDB
11. MongoDB indexing
    a. Create index in MongoDB
    b. Finding the indexes in a collection
    c. Drop indexes in a collection
    d. Drop all the indexes
12. MongoDB with java and PHP
    a. Create a simple application that uses MongoDB with Java
    b. Create a simple application that uses MongoDB with PHP

Web References:

1. https://beginnersbook.com/2017/09/mongodb-tutorial/
2. https://digi.ninja/projects/nosqli_lab.php

VI SEMESTER	L	T	P	C
	2	-	-	-
20MB6M01 : PROFESSIONAL ETHICS AND INTELLECTUAL PROPERTY RIGHTS				

COURSE OUTCOMES:

CO1: Identify the professional roles played by an engineer and illustrate the process of Social experimentation

CO2: Determine Engineer's responsibilities and rights towards the society

CO3: Analyze various aspects of Intellectual Property Rights and recognize the process of protecting thecopyrights

CO4: Describe the registration process of Patents and trademarks and also demonstrate the concept of tradesecrets and cybercrimes

CO5: Evaluate the ethical and legal considerations involved in the creation, use, and dissemination of intellectual property.

UNIT – 1

ENGINEERING ETHICS:

Importance of Engineering Ethics-–Professional and Professionalism –Professional Roles to be played by anEngineer –Professional Ethics.

UNIT – 2

ENGINEERING AS SOCIAL EXPERIMENTATION :

Role of engineering in knowledge society- Knowledge acquired – Conscientiousness –Relevant InformationEngineers as Managers, Consultants, and Leaders.

ENGINEERS' RESPONSIBILITY FOR SAFETY AND RISK: Role and importance of Safety and riskTypes of Risks –Threshold Levels for Risk– Risk Benefit Analysis.

UNIT – 3

ENGINEERS' RESPONSIBILITIES AND RIGHTS:

Collegiality-Conflict of Interest-solving conflict problems – Ethical egoism-Collective bargaining - Confidentiality-Acceptance of Bribes/Gifts--Occupational Crimes-industrial espionage-Whistle Blowing typesof whistle blowing.

UNIT – 4

INTELLECTUAL PROPERTY AND COPY RIGHTS:

Introduction to Intellectual Property Law - Types of Intellectual Property – Infringement, Copyrights: Introduction to Copyrights – Principles of Copyright – Rights Afforded by Copyright Law –Copyright Formalities and Registration.

UNIT – 5

PATENTS AND TRADEMARKS:

Introduction to Patent Law –Rights under Patent Law – Patent Requirements – Patent Application Process and Granting of Patent – Double Patenting – Patent Cooperation Treaty. Trademarks:Introduction to Trade Mark – Trade Mark Registration Process – Trade Markmaintenance – Likelihood of confusion

TEXT BOOKS:

1. M.Govindarajan, S.Natarajan and V.S.SenthilKumar- "Engineering Ethics and Human Values" by PHILearning Pvt. Ltd-2009.

2. Deborah E.Bouchoux, "Intellectual Property". Cengagelearning , NewDelhi, BS Publications (Press)

3. Prabhuddha Ganguli,,, Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi

E – Contents :

1. https://www.geeksforgeeks.org/intellectual-property-rights/
2. https://egyankosh.ac.in/bitstream/123456789/90502/1/Unit-15.pdf
3. https://www.tutorialspoint.com/information_security_cyber_law/intellectual_property_right.htm
4. https://www.drishtiias.com/to-the-points/paper3/intellectual-property-rights

VI SEMESTER	L	T	P	C
	3	-	-	4
20AD6M01 : APPLICATIONS OF AI IN DATA SCIENCE				

Unit – I :

Introduction to AI and Data Science: Overview of AI and Data Science and Machine Learning importance of AI in Data Science, role of AI in Data Science ,Key components of Data Science, Tools and libraries in AI for Data Science (Python, R, TensorFlow, PyTorch, Scikit-learn)

Unit – II

Machine Learning Fundamentals: Supervised Learning, Regression, Classification: Logistic Regression, Decision Trees, K-Nearest Neighbors (KNN), Support Vector Machines (SVM), Model Evaluation

Unsupervised Learning: Clustering: K-Means, DBSCAN, Hierarchical Clustering, Dimensionality Reduction: PCA (Principal Component Analysis), LDA (Linear Discriminant Analysis)

Unit – III

Advanced-Data Science with Machine Learning: Ensemble Methods Random Forest, Gradient Boosting Machines (GBM), XGBoost, AdaBoost Stacking, Bagging, Boosting, Model Selection and Hyperparameter Tuning

Unit – IV

AI for Predictive Analytics and Decision Making: Predictive Modeling-Time Series Forecasting: ARIMA, SARIMA, and LSTM Models, Regression Models for Predictive Analytics (Linear, Decision Trees, Neural Networks), Anomaly Detection, Reinforcement Learning Overview- Q-Learning, Deep Q Networks (DQN)

Unit – V

Ethics, Privacy, and Responsible AI:AI Ethics, Bias in AI models and its impact on fairness, Ethical guidelines and best practices for AI development, Transparency and Accountability in AI-driven decision-making, Privacy and Security Concerns, GDPR and Data Privacy Regulations

Text books :

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron
2. Deep Learning with Python by François Chollet
3. Python Machine Learning by Sebastian Raschka and Vahid Mirjalili
4. Introduction to Machine Learning with Python by Andreas C. Müller and Sarah Guido

References:

1. Artificial Intelligence*:* A Modern Approach by Stuart Russell and Peter Norvig
2. Online courses on Coursera (Andrew Ng's Machine Learning, Deep Learning Specialization)Kaggle competitions and datasets for hands-on practice

E – Contents:

1. https://iabac.org/blog/the-real-world-applications-of-artificial-intelligence-in-data-science
2. https://www.coursera.org/articles/ai-in-data-science