ACADEMIC REGULATIONS (R-20)
COURSE STRUCTURE
AND
DETAILED SYLLABI

M.Tech Regular (Full Time) Two Year Post Graduate Degree Programme

(For the Batches Admitted From the Academic Year 2020-2021)

COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)

Department of Computer Science and Engineering

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Accredited by NBA, New Delhi, Accredited by NAAC, Bengaluru |Affiliated to JNTUA, Ananthapuramu, Recognized by UGC under 12(B) & 2(F) | Approved by AICTE, New Delhi)

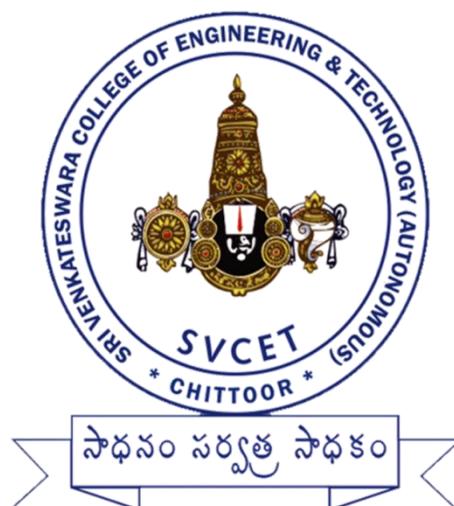**R.V.S. NAGAR, TIRUPATI ROAD, CHITTOOR- 517 127 (AP)-INDIA**
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ACADEMIC REGULATIONS-R20, COURSE STRUCTURE AND DETAILED SYLLABI

M.TECH REGULAR (Full-Time) TWO YEAR DEGREE PROGRAMME
(*FOR THE BATCHES ADMITTED FROM THE ACADEMIC YEAR 2020-21*)

MASTER OF TECHNOLOGY

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
Accredited by NBA, New Delhi & NAAC, Bengaluru │Affiliated to JNTUA, Ananthapuramu,
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R.V.S. NAGAR, TIRUPATI ROAD, CHITTOOR – 517 127 (A.P) – INDIA

Website: www.svcetedu.org   E-mail: principal@svcetedu.org

SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
(AFFILIATED TO JNTUA, ANANTAPUR)
ACADEMIC REGULATIONS – R20
MASTER OF TECHNOLOGY (M.TECH)
REGULAR (Full-Time) TWO YEAR POST GRADUATE DEGREE PROGRAMME
(For the batches admitted from the Academic Year 2020-2021)

The Jawaharlal Nehru Technological University Anantapur, Ananthapuramu shall confer M.Tech Post Graduate degree to candidates who are admitted to the Master of Technology Program and fulfill all the requirements for the award of the degree.

1.0   **Applicability:** All the rules specified herein, approved by the Academic Council, shall be in the force and applicable to the students admitted from the Academic Year 2020-2021 onwards. Any reference to "College" in these rules and regulations stands for SVCET.

2.0   **Extent:** All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation. As and when a doubt arises, the interpretation of the Chairman, Academic Council shall be final and ratified by the Academic Council in the forthcoming meeting. As per the requirements of statutory bodies, Principal, Sri Venkateswara College of Engineering College shall be the Chairman, Academic Council.

3.0   **Admission:** Admission into the first year of two year M.Tech degree programme is based on the eligibility conditions detailed below.

4.0   **Eligibility:**
Admission to the above programme shall be made subject to the eligibility, qualifications and specialization prescribed by the competent authority for each programme, from time to time. Admissions shall be made either on the basis of merit rank obtained by the qualified candidates at an Entrance Test conducted by the University or on the basis of GATE / PGECET score, subject to reservations and policies prescribed by the Government from time to time.

4.1   **Admission Procedure:**
As per the existing stipulations of AP State Council for Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made into the first year as follows:
a) Category –A seats are to be filled by Convenor through APPGECET / GATE score.
b) Category-B seats are to be filled by Management as per the norms stipulated by Government of A.P.

5.0   **Specializations:**

S. No.	Branch	Specialization
1	CE	Structural Engineering
2	EEE	PE&ED
3	ME	CAD/CAM
4	ECE	VLSI Design
5	CSE	Computer Science and Engineering
6	CSE	CSE(Data Science)

6.0   **Course Work:**
A Candidate after securing admission must pursue the M.Tech course of study for Four Semesters duration. Each semester shall have a minimum of 16 instructional weeks.
A candidate admitted to a programme should complete it within a period equal to twice the prescribed duration of the programme from the date of admission.

7.0   **Contact Periods:**
Depending on the complexity and volume of the course, the numbers of contact periods per week are assigned.

7.1   **Credit Courses:** Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in an L: T: P: C (Lecture Hours: Tutorial Hours: Practical Hours: Credits) structure, based on the following pattern.

7.2   **Theory Courses:** One hour Lecture (L) per Week in a Semester = 01 Credit.

7.3   **Practical Courses:** One Practical hour (P) per Week in a Semester = 0.5 Credit.

7.4   **Audit Courses (AC) = NOCREDITS** are awarded

7.5   **Mini Project:** For Mini Project, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

7.6   **Dissertation Work:** For Dissertation Work, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

7.7   The Two year curriculum of Post Graduate Degree Program M. Tech shall have total of 68 credits.

8.0   **Choice Based Credit System (CBCS):**

8.1   Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centered learning
- Students to learn courses of their choice

A Student has a choice of registering for courses comprising basic science, program core and professional elective.

9.0   **Evaluation:**

The performance of the candidate in each semester shall be evaluated subject wise, with a maximum of 100 marks for Theory and 100 marks for practical's, on the basis of Internal Evaluation and End Semester Examination.

For the theory subjects, 60% of the marks will be for the External End Examination. While 40% of the marks will be for Internal Evaluation. Internal marks for midterm examinations shall be arrived at by considering the marks secured by the student in both the midterm examinations with 80% weightage to the better midterm exam and 20% to the other. First midterm examinations will be conducted in the middle of the Semester (first two units) and second midterm examinations immediately after the completion of instruction (last three units) with four questions with internal choice, either or type, are to be answered in 2 hours, evaluated for 40 marks.

For semester end examination five questions shall be given for a maximum of 60 marks with one question from each unit with internal choice i.e. either or type. All questions carry equal marks.

For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day to day performance (25 marks) and practical test at the end of the semester (15 marks).

For Mini Project there will be an internal evaluation for 100 marks. A candidate has to secure a minimum of 50% to be declared successful. The assessment will be made by a board consisting of HOD, Mini Project supervisor and one senior faculty of the department.

A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

In case the candidate does not secure the minimum academic requirement in any of the subjects, he has to reappear for the Semester Examination either supplementary or regular in that subject, or repeat the subject when next offered or do any other specified subject as may be required.

In case of audit course, students will be able to register for courses outside the prescribed range of Credits for audit only, when interested to supplement their knowledge / skills; any student who wishes

to pursue audit course can register for the same with the concerned teacher and attend to the classes regularly. No examination will be conducted; no grade will be given for the audit courses. However such of those students who have registered and got the requisite attendance of 75% in the audit course, it will be mentioned in their grade sheet.

10.0	**Dissertation Work:**
10.1	**Registration of Dissertation work**

A candidate shall register for the dissertation work at the beginning of the second year, only after satisfying the attendance requirement of all the courses up to II Semester. The duration of the dissertation work is for two semesters.

10.2 The candidate has to submit, in consultation with the supervisor, the title, objective and plan of action of dissertation work to the Department Evaluation Committee (DEC) for its approval. Only after obtaining the approval from DEC, the student can initiate the dissertation work.

11.0 **Evaluation of Dissertation Work**

11.1 The Department Evaluation Committee (DEC) consisting of HOD, Supervisor and one internal senior faculty member shall monitor the progress of the project work. The DEC is constituted by the Principal on the recommendation of the Head of the Department.

11.2 Dissertation work Phase – I is to be completed in the III Semester. The student has to identify the topic of the project work, collect relevant literature, preliminary data, implementation tools/methodologies etc., and perform a critical study and analysis of the problem identify and submit a report.

(i) Internal Evaluation: The internal evaluation of dissertation work phase – I shall be made by the DEC on the basis of two project reviews on the topic of the project. Each review shall be conducted for a maximum of 40 marks. For a total of 40 marks, 80% of better one of the two and 20% of the other one are added and finalized.

(ii) Semester-End Evaluation: The Semester end dissertation work phase – I Viva-Voce examination shall be conducted for 60 marks, by the HOD, concerned supervisor and a senior faculty member recommended by the HOD and appointed by the Principal.

11.**3** The student shall continue to undertake the dissertation work phase – II during the IV Semester by conducting practical investigations, implementation, analysis of results, validation and report writing. The student shall submit a dissertation report at the end of the semester after approval of the DEC.

(i) Internal Evaluation: The internal evaluation of dissertation work phase – II shall be made by the DEC on the basis of two project reviews on the progress, presentation and quality of work. Each review shall be conducted for a maximum of 120 marks. For a total of 120 marks, 80% of better one of the two and 20% of the other one are added and finalized.

(ii) Semester-End Evaluation: A candidate shall be allowed to submit the dissertation on the recommendations of the DEC. Three copies of the Dissertation certified in the prescribed format by the concerned Supervisor and HOD shall be submitted to the department. The Department shall submit a panel of three experts for a maximum of 05 students to the principal for appointment of the external examiner. The Viva-voce examination shall be conducted by the board consisting of the Supervisor, Head of the Department and the external examiner nominated by the principal. The board shall jointly award the marks for 180.

11.4 A candidate shall be deemed to have secured the minimum academic requirement of project work if he secures a minimum of 40% marks in the viva-voce examination and a minimum aggregate of 50% of the total marks in the end viva-voce examination and the internal assessment marks taken together. If he fails to get the minimum academic requirement he has to appear for the viva-voce examination again to get the minimum marks. The viva voce examination may be conducted once in two months for all the candidates who have submitted thesis during that period.

12.0 **Eligibility to appear for the Semester-End Examination (SEE)**

12.1 A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the courses in a semester.

12.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below75%) in each semester may be granted by the College Academic Council.

12.3 Shortage of Attendance below 65% in aggregate shall **in no case be condoned**.

12.4   Student whose shortage of attendance is not condoned in any semester is not eligible to take their end examination of that class and their registration shall stand cancelled.

12.5   A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable. The student may seek readmission for the semester when offered next. He will not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

12.6   A stipulated fee shall be payable to the College towards condonation of shortage of attendance.

12.7   The attendance in Student Development Activities shall be considered for finalization of aggregate attendance.

12.8   For the calculation of a student attendance in any semester, the total number of classes conducted shall be counted as scheduled in the class-work time table.

13.0   Conduct of Semester End Examination and Evaluation
13.1   Semester end examination shall be conducted by the Controller of Examination (COE) by inviting 50% Question Papers from the External and 50% Question papers from the Internal Subject Experts. Principal will decide the External and Internal subject experts.

13.2   The answer papers of semester end examination should be evaluated externally / internally.

13.3   Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the End examinations. The marks for the internal evaluation components shall be added to the external evaluation marks secured in the Semester-end examinations, to arrive at the total marks for any course in that semester.

13.4   Performance in all the subjects is tabulated program-wise and will be scrutinized by the office of the Controller of Examinations. Total marks obtained in each subject are converted into letter grades. Finally subject-wise marks and grades details, subject-wise and branch-wise pass percentages are calculated through software.

14.0   Results Committee
14.1   Results Committee comprising of Principal, Controller of Examinations, Additional Controller of Examinations (Confidential) and one Senior Professor nominated by the Principal and the University Nominee will oversee the details of marks, grades and pass percentages of all the subjects and branch-wise pass percentages.

14.2   Office of the Controller of Examinations will generate student-wise result sheets and the same will be published through college website.

14.3   Student-wise Grade Sheets are generated and issued to the students.
15.0   Personal Verification / Recounting / Revaluation / Final Valuation
15.1   **Personal Verification of Answer Scripts:**
Candidates appear in a particular semester end examinations may appeal for verification of their answer script(s) for arithmetic correction in totaling of marks and any omission / deletion in evaluation within 7 days from the date of declaration of results at the office of the Controller of Examinations on the prescribed proforma and by paying the prescribed fee per answer script.
It is clarified that personal verification of answer script shall not tantamount to revaluation of answer script. This is only a process of reverification by the candidate. Any mistake / deficiency with regard to arithmetic correction in totaling of marks and any omission / deletion in evaluation if found, the institution will correct the same.

15.2	**Recounting / Revaluation:**

Students shall be permitted for request for recounting/revaluation of the Semester-End examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student will be issued a revised grade sheet. If there are no changes, the same will be intimated to the students.

15.3	**Final Valuation:**

Students shall be permitted for request for final valuation of the Semester–End Examination answer scripts within a stipulated period after the publication of the revaluation results by paying the necessary fee. The final valuation shall be carried out by an expert not less than Associate Professor as per the scheme of valuation supplied by the examination branch in the presence of the student, Controller of Examinations and Principal. However students are not permitted to discuss / argue with the examiner. If the increase in marks after final valuation is equal to or more than 15% of the previous valuation marks, the marks obtained after final valuation shall be treated as final. If the variation of marks after final valuation is less than 15% of the previous valuation marks, then the earlier valuation marks shall be treated as the final marks.

16.0 **Supplementary Examinations:** In addition to the regular semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

17.0 **Re-Registration for improvement of Internal Marks**

17.1 Following are the conditions for Re-Registration of Theory Courses for improvement of Internal Marks:

17.2 The student should have completed all the course work and obtained examinations results from I to III semesters.

17.3 If the student has failed in the examination due to internal evaluation marks secured being less than 50%, he shall be given one chance for a maximum of 3 theory courses for improvement of internal evaluation marks.

17.4 The candidate has to register for the chosen courses and fulfill the academic requirements (i.e. a student has to attend the classes regularly and appear for the mid-examinations and satisfy the attendance requirements to become eligible for appearing at the semester-end examinations).

17.5 For each course, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D./ Challan in favour of the Principal, Sri Venkateswara College of Engineering & Technology, payable at Chittoor along with the requisition through the concerned Head of the Department.

17.6 A student availing the benefit for Improvement of Internal evaluation marks, the internal evaluation marks as well as the semester-end examinations marks secured in the previous attempt(s) for the re-registered courses stands cancelled.

18.0 **Academic Requirements for completion of Post Graduate Degree Program M.Tech:**
The following academic requirements have to be satisfied in addition to the attendance requirements for completion of Post Graduate Degree Program M.Tech.
For students admitted into Post Graduate Degree Program M.Tech for the Academic Year 2020-21:

18.1 A student shall be deemed to have satisfied the minimum academic requirements for each theory, laboratory course, and Internship and project work, if he secures not less than 40% of marks in the semester-end examination and a minimum of 50% of marks in the sum total of the internal evaluation and Semester-end examination taken together.
A student shall be deemed to have satisfied the minimum academic requirements of mini-project, if he secures not less than a minimum of 50% of marks.

18.2   A student shall register for all the **68** credits and earn all the **68** credits. Grade points obtained in all the 6**8** credits shall be considered for the calculation of the DIVISION based on CGPA.

18.3   A student who fails to earn **68** credits as indicated in the course structure within **four** academic years from the year of their admission shall forfeit his seat in M.Tech Program and his admission stands cancelled.

19.0   Grades, Semester Grade point Average, Cumulative Grade point Average:

19.1   **Grade System:** After all the components and sub-components of any subject (including laboratory subjects) are evaluated, the final total marks obtained will be converted to letter grades on a "10 point scale" described below.

% of Marks obtained	Grade	Grade Points (GP)
90 to 100	A+	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
50 to 59	D	6
Less than 50% in Sum of Internal & External (or) Less than 40% in External	F	0
Not Appeared	N	0

19.2   Computation of SGPA and CGPA

19.2.1   The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\text{SGPA} = \Sigma\ (C_i \times G_i)\ /\ \Sigma\ C_i$$

where, C_i is the number of credits of the ith subject and G_i is the grade point scored by the student in the ith course

19.2.2   The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$\text{CGPA} = \Sigma\ (C_i \times S_i)\ /\ \Sigma\ C_i$$

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

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

19.2.4   While computing the SGPA/CGPA, the subjects in which the student is awarded Zero grade points will also be included.

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

19.2.6   **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, F and N.

19.2.7   As per AICTE regulations, conversion of CGPA into equivalent percentage is as follows:

Equivalent Percentage to SGPA = (SGPA – 0.50) x 10
Equivalent Percentage to CGPA = (CGPA – 0.50) x 10

19.3   **Grade Sheet:** A grade sheet (Marks Memorandum) will be issued to each student Indicating his performance in all subjects registered in that semester indicating the GPA and CGPA. GPA and CGPA will be rounded off to the second place of decimal.

20.0   **Consolidated Grade Sheet:** After successful completion of the entire Program of study, a Consolidated Grade Sheet containing performance of all semesters will be issued as a final record. Duplicate Consolidated Grade Sheet will also be issued, if required, after payment of requisite fee.

21.0   **Award of Degree:** The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendation of The Principal of SVCET (Autonomous). Student admitted in M.Tech 2Yrs programme shall register for all **68** credits and earn all the **68** credits. Marks obtained in all the **68** credits shall be considered for the award of the class based on CGPA.

21.1   **Eligibility:** A student shall be eligible for the award of M.Tech Degree if he fulfills all the following conditions:
- Registered and successfully completed all the components prescribed in the program of study for which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 6.0 (Minimum requirement for declaring as passed.)

21.2   **Award of Class:** Declaration of Class is based on CGPA.

Cumulative Grade Point Average	Class
≥7.75	First Class with Distinction
≥6.75 and<7.75	First Class
≥6.0 and <6.75	Second Class

22.0   **With Holding of Results:**
If the candidate has not paid dues to the University / College or if any case of in-discipline is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

23.0   **Graduation Day:**
The institute shall have its own annual Graduation Day for the award of Provisional Certificates to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

24.0   **Discipline:**
Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he shall be liable for punitive action as prescribed by the Institute from time to time.

25.0   **Grievance Redressal Committee:**
The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

26.0   **Transitory Regulations:**
Students who got detained for want of attendance (**or**) who have not fulfilled academic requirements

(**or**) who have failed after having undergone the Program in earlier regulations (**or**) who have discontinued and wish to continue the Program are eligible for admission into the unfinished semester from the date of commencement of class work with the same (**or**) equivalent courses as and when courses are offered and they will be in the academic regulations into which they are presently readmitted. A student has to satisfy all the eligibility requirements within the maximum stipulated period of **four years** for the award of M.C.A Degree.

27.0   Medium of Instruction:
The Medium of Instruction is **English** for all courses, laboratories, Internal and External examinations, Seminar Presentation and Project Reports.

28.0   Mode of Learning:
Preferably 50% course work for the theory courses in every semester shall be conducted in the blended mode of learning. If the blended learning is carried out in online mode, then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

29.0   General Instructions:
i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Disciplinary action for Malpractice/improper conduct in examinations is appended.
iii. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
v. The Principal may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Principal.
vi. The above rules and regulations are to be approved / ratified by the College Academic Council as and when any modification is to be done.

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FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

Identification of Courses

M. Tech

Each course shall be uniquely identified by an alphanumeric code of width 7 characters as given below.

No. of Digits	Description
First two digits	Year of regulations Ex:20
Next one letter	Type of program: A: B. Tech B: M. Tech C: M.B.A D: M.C.A
Next two letters	Code of program: ST: Structural Engineering, P.E: Power Electronics & Electric Drives, CM: CAD/CAM, VL: VLSI, CS: Computer Science and Engineering, DS: Data Science
Last two digits	Indicate serial numbers: ≥ 01

Ex:
20BST01
20BPE01
20BCM01
20BVL01
20BCS01
20BDS01

Sl.No.	Nature of Malpractices / Improper conduct If the candidate	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester / year. The Hall Ticket of the candidate is to be cancelled.
3.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester / year.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the

		candidate is subject to the academic regulations in connection with forfeiture of seat.
6.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits of seat.
7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
8.	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction or property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate (s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester / year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester / year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or	Cancellation of the performance in that subject.

	writes to the examiner requesting him to award pass marks.	
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Examination committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

VISION

- Evolve as center of Excellence in computer science and Engineering education with national and international reputation and adapt itself to the rapid advancements in the computer Science and Engineering Field.

MISSION

- To impart high quality professionals in undergraduate and postgraduate level with emphasis on basic principles of computer Science and Engineering and to foster leading edge research in the fast changing field.
- To inculcate professional behavior, strong ethical values, innovative research capabilities and leadership abilities in the young minds so as to work with a commitment to the progress of the nation

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

ROGRAMME EDUCATIONAL OBJECTIVES

- **PEO1:** Graduates of the program will be employed in industry, government and entrepreneurial endeavors to have a successful professional career.

- **PEO2:** To engage in sustainable development and demonstrate data analysis skills for effective interpretation and decision making to solve real life problems.

- **PEO3:** To be able to adapt to the evolving technical challenges and changing career opportunities. Learn to effectively communicate ideas in oral, written, or graphical form to promote collaboration other engineering teams in accordance with social standards and ethical practices.

PROGRAMME SPECIFIC OUTCOMES

- **PSO1:** Understand the various processes involved in application development in the Context of data science.

- **PSO2:** Develop realistic solutions to meet the requirements of the society and the industry using the acquired data analytics skills.

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

PROGRAM OUTCOMES

PO1   To obtain sound knowledge in the theory, principles and applications of computer systems.

PO2   Having an ability to apply mathematics and science in engineering applications.

PO3   Configure recent software tools, apply test conditions, and deploy and manage them on comput

PO4   Having an ability to design and conduct experiments, as well as to analyze and interpret data, and synthesis of information.

PO5   Having an ability to use techniques, skills, resources and modern engineering and IT tools necessary for engineering practice

PO6   Identify, formulate and solve software engineering problems and understand the software project management principles.

PO7   nderstand the computing needs of inter-disciplinary scientific and engineering disciplines and develop algorithms and techniques for achieving these.

PO8   Communicate effectively in oral, written and graphical form to extend entrepreneurship and leadership skills.

PO9   Ability to extend the state of art in some of the areas of interest and create new knowledge.

PO10   Having problem solving ability- to assess social issues (societal, health, safety, legal and cultural) and engineering problems

PO11   Toidentifytheshortcomingsandexaminetheoutcomesofone'sactionwithout depending on external feedback and implement the corrective measures subsequently to develop their career.

SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
R.V.S. NAGAR, CHITTOOR - 517127, A.P.

COURSE STRUCTURE AND SCHEME OF EXAMINATION FOR M.TECH-CSE (DS)

M.TECH, I-SEMESTER

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
1	20BDS01	Mathematical Foundations of Computer Science	3	0	0	3	40	60	100
2	20BDS02	Python and statistical Programming	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE – I									
3	20BDS03	Information Storage Management	3	0	0	3	40	60	100
	20BDS04	Cloud and Fog Computing							
	20BDS05	Big data Mining							
PROFESSIONAL ELECTIVE – II									
4	20BDS06	Data Preparation and Analysis	3	0	0	3	40	60	100
	20BDS07	Data Security and Access Control							
	20BDS08	Web and Text Analytics							
5	20BMB21	Research Methodology	2	0	0	2	40	60	100
6	20BDS09	Data Science Lab-I	0	0	4	2	40	60	100
7	20BDS10	Data Science Lab-II	0	0	4	2	40	60	100
8	20BDS11	Audit Course - I English for Research Paper Writing	2	0	0	-	-	-	-
TOTAL			16	0	8	18	280	420	700

M.TECH, II-SEMESTER

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
1	20BDS12	Optimization techniques	3	0	0	3	40	60	100
2	20BDS13	Machine Learning	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE – III									
3	20BDS14	Multivariate Techniques For Data Analysis	3	0	0	3	40	60	100
	20BDS15	Security in Cloud							
	20BDS16	Image and Video Analytics							
PROFESSIONAL ELECTIVE – IV									
4	20BDS17	Data Storage Technologies and Networks	3	0	0	3	40	60	100
	20BDS18	Big Data Security							
	20BDS19	Business Analytics							
5	20BDS20	Mini Project	0	0	4	2	100	00	100
6	20BDS21	Data Science Lab-III	0	0	4	2	40	60	100
7	20BDS22	Data Science Lab-IV	0	0	4	2	40	60	100
8	20BDS23	Audit Course - II (Value Education)	2	0	0	-	-	-	-
TOTAL			**14**	**0**	**12**	**18**	**340**	**360**	**700**

M.TECH, III SEMESTERS

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
PROFESSIONAL ELECTIVE – V									
1	20BDS24	Data Visualization	3	0	0	3	40	60	100
	20BDS25	Risk Analytics							
	20BDS26	Social Network Analysis							
PROFESSIONAL ELECTIVE – VI									
2	20BDS27	Natural Language Processing	3	0	0	3	40	60	100
	20BDS28	Decision Management Systems							
	20BDS29	Advanced Algorithms							
3	20BDS30	**DISSERTATION PHASE-I**	-	-	20	10	40	60	100
TOTAL			**6**	**0**	**20**	**16**	**120**	**180**	**300**

M.TECH, IV-SEMESTERS

S.NO	SUBJECT CODE	SUBJECT	PERIODS			CREDITS	SCHEME OF EXAMINATION (MAXIMUM MARKS)		
			L	T	P		CIE	SEE	TOTAL
1	20BDS31	**DISSERTATION PHASE-II**	-	-	32	16	120	180	300
TOTAL						**16**	**120**	**180**	**300**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE (DS)

	L	T	P	C
	3	0	0	3

20BDS01   MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Course Objectives:
The objectives of this course are to
1. Acquaint the students with mathematical/logical fundamentals including numerical techniques,
2. Understand probability, sampling and graph theory that serve as an essential tool for applications of computer and information sciences.

UNITI

Probability mass, density,and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains.,Hypothesis Testing,One tailed and Two tailed test,Annova test.

UNITII

Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood

UNITIII

Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis. The problem of over fitting model assessment.

UNIT IV

Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems

UNIT V

Computer science and engineering applications, Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.

Course Outcomes:
After Completion of the course the student will be able to

1. Understand the numerical methods to solve and find the roots of the equations.
2. Utilize the statistical tools in multi variable distributions.
3. Use probability formulations for new predictions with discrete and continuous RV's.

4. Understand various graphs in different geometries related to edges.
5. Understand vector spaces and related topics arising in magnification and rotation of images.

TEXT BOOK:

1. John Vince, Foundation Mathematics for Computer Science, Springer, 2015.

REFERENCE BOOKS:

1. K. Trivedi, Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley, 2016.
2. M. Mitzenmacher, E. Upfal, Probability and Computing: Randomized Algorithms and Probabilistic Analysis, 2005.
3. Alan Tucker, Applied Combinatorics, Wiley Publications, 2017.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2					2						2
CO2	3		1				2						2
CO3												1	
CO4													2
CO5												1	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE(DS) **L T P C**

3 0 0 3

20BDS02   **PYTHON AND STATISTICAL PROGRAMMING**

Course Objectives:
The objectives of this course are to
1. Understand the basics of python and its uses.
2. Describe the types, operators, expressions and control Statements in python.
3. Apply the functions and OOPS concepts in python.
4. Understand about fundamentals of R programming.
5. Create Looping and Graphics in R Programming.

UNITI

Introduction to 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.

UNITII

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

UNITIII

Functions in Python: 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.

Object Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding,

UNITIV

Introduction to R: How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT V

R Programming Structures, Control Statements, Loops: Looping Over Non vector Sets, If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective.

Graphics: Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

Course Outcomes:

After Completion of the course the student will be able to

1. Write basic Python programming.
2. By using types, operators and expressions in python.
3. Apply OOPS concept in python.
4. Develop the real world   application using programming in R Language.
5. Design the graphics with R programming.

TEXT BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.
3. The Art of R Programming, A K Verma, Cengage Learning.
4. R for Everyone, Lander, Pearson.
5. The Art of R Programming, Norman Matloff, No starch Press.

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. R Cookbook, Paul Teetor, Oreilly.
5. R in Action, Rob Kabacoff, Manning.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3					2					1	
CO2	3				2								1
CO3	2	3	2	2									
CO4	3	2			2	2						1	
CO5	3		2			2		3					2

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE (DS)   **L T P C**
                                                        3 0 0 3

20BDS03   INFORMATION STORAGE AND MANAGEMENT

(Professional Elective- I)

Course Objectives:
The objectives of this course are to
1. Identify the components of managing the data center and Understand logical and physical components of a storage infrastructure.
2. Evaluate storage architectures, including storage subsystems SAN, NAS, IPSAN,CAS.
3. Understand thebusiness continuity, backup and recovery methods.

UNIT I-INTRODUCTION TO STORAGE AND MANAGEMENT

Introduction to Information Storage Management - Data Center Environment–Database Management System (DBMS) - Host - Connectivity –Storage-Disk Drive Components- Intelligent Storage System -Components of an Intelligent Storage System- Storage Provisioning- Types of Intelligent Storage Systems.

UNIT II- FIBRE CHANNEL

Fibre Channel: Overview - SAN and Its Evolution -Components of FC SAN -FC Connectivity-FC Architecture- IPSAN-FCOE-FCIP-Network-Attached Storage- General-Purpose Servers versus NAS Devices - Benefits of NAS- File Systems and Network File Sharing-Components of NAS - NAS I/O Operation -NAS Implementations -NAS File-Sharing Protocols-Object-Based Storage Devices-Content-Addressed Storage -CAS Use Cases

UNIT III-BACKUP AND RECOVERY

Business Continuity -Information Availability -BC Terminology-BC Planning Life Cycle - Failure Analysis -Business Impact Analysis-Backup and Archive - Backup Purpose –Backup Considerations - Backup Granularity - Recovery Considerations -Backup Methods -Backup Architecture - Backup and Restore Operations.

UNIT IV-CLOUD COMPUTING

Cloud Enabling Technologies -Characteristics of Cloud Computing -Benefits of Cloud Computing - Cloud Service Models-Cloud Deployment models-Cloud computing Infrastructure-Cloud Challenges.

UNIT V-SECURING AND MANAGING STORAGE INFRASTRUCTURE

Information Security Framework -Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure -Storage Infrastructure Management Activities - Storage Infrastructure Management Challenges.

Course Outcomes:

After Completion of the course the student will be able to

1. Understand the Concept of Information Storage and Data centre Environment

2. Know the Backup and Archive Technologies.

3. Know and understand Intelligent Storage System

TEXT BOOKS:

1. EMC Corporation, *Information Storage and Management*, WileyIndia, 2nd Edition, 2011.

2. Robert Spalding, "*Storage Networks: The Complete Reference*", Tata McGraw Hill,

Osborne, 2003.

3. Marc Farley, *Building Storage Networks*, Tata McGraw Hill , Osborne,2nd Edition, 2001.

4. Meeta Gupta, *Storage Area Network Fundamentals*, Pearson Education Limited, 2002.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	2			2		3			2		1	
CO2	2		1										2
CO3		3		2		3				1		2	

4- High mapping   **2-Medium Mapping**   **1- Low Mapping**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE (DS)   **L T P C**
                                                  3 0 0 3

20BDS04   **CLOUD AND FOG COMPUTING**

(Professional Elective- I)

Course Objectives:
The objectives of this course are to
1. Understand the in-depth concepts of Fog computing concept, technology, architecture, and applications
2. Understand the state-of-art fundamental issues in Fog Computing.
3. Understand the evolution of fog computing from cloud computing.
4. Understand the feasibility of big data analytics through Fog.

UNIT- I

Internet of Things (IoT) and New Computing Paradigms: Introduction, Relevant Technologies, Fog and Edge Computing Completing the Cloud, Hierarchy of Fog and Edge Computing, Business Model, Opportunities, and Challenges. **Addressing the Challenges in Federating Edge Resources:** Introduction, the Networking Challenges in Federated Edge Environment, The Management Challenge, Miscellaneous Challenges

UNIT- II

Integrating IoT, Fog and Cloud Infrastructure: System Modeling and Research Challenges: Introduction, Methodology, Integrated C2F2T Literature by Modeling Technique, Integrated C2F2T Literature by Use-Case Scenarios, Integrated C2F2T Literature by Metrics

UNIT- III

Management and Orchestration of Network Slices in 5G,Fog, Edge, and Cloud: Introduction, Background, Network Slicing in 5G, Network Slicing in Software-Defined Clouds, Network Slicing Management in Edge, and Fog.

UNIT- IV

Middleware for Fog and Edge Computing Design: Introduction, Need for Fog, and Edge Computing Middleware, Design Goals, State-of-Art Middleware Infrastructures, System Model.

Data Management in Fog Computing: Introduction, Background, Fog Data Life Cycle

UNIT- V

Fog Computing Realization for Big Data: Introduction, Big Data Analytics, Data Analytics in the Fog, Prototype, and Evaluations. **Legal Aspects of Operating IoT Applications in the Fog:** Introduction, Classification of Fog/Edge/IoT Applications, Restrictions of the GDPR Affecting Cloud, Fog and IoT Applications, Data protection by Design Principles.

Course Outcomes:

After Completion of the course the student will be able to

1. Identify issues with current cloud computing architecture concerning IoT and Big Data
2. Identify problems, explain, analyze and evaluate various fog computing solutions
3. Attempt to generate new innovative ideas utilizing fog computing
4. Apply fog computing for real-time applications

TEXTBOOKS:

1. Fog and Edge Computing: Principles and Paradigms- Buyya Rajkumar, and Satish Narayana Srirama, John Wiley & Sons (2019).

REFERENCE BOOKS:

1. Zaigham Mahmood, " Fog Computing: Concepts, Framework, and technologies", Springer (2018)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2						3		3				3
CO2	1						3		3				2
CO3							2		3			1	
CO4	2						2		3				
CO5							2		3				2

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE (DS)   **L T P C**
       3 0 0 3

20BDS05   **BIG DATA MINING**

(Professional Elective- I)

Course Objectives:
The objectives of this course are to
1. To understand importance of big data and data analytics
2. To learn Basic Data analytic methods
3. To learn Basic Data analytic methods using R
4. To get a knowledge on advanced analytical methods, technology and tools

UNIT-I
Big data overview-State of the practice in Analytics-Key roles for new big data ecosystem Data Analytics Lifecycle-Data analytics lifecycle overview- Discovery- Data Preparation-Model Planning-Model Building Communicate Results operationalize

UNIT-II
Introduction to R-Exploratory Data Analytics-Statistical methods for evaluation Hadoop& Map Reduce framework for R, R with Relational Database Management Systems, R with Non-Relational (NoSQL) DBs

UNIT-III
Clustering-Overview of Clustering-K-means, Association Rules-Overview-Apriori Algorithm-Evaluation of candidate rules-An Example: Transactions in grocery Store-Validation and Testing-Diagnostics, Regression-Linear Regression-Logistic Regression-Reason to choose and Cautions-Additional Regression Models

UNIT-IV
Classification-Decision Trees-Naïve Bayes-Diagnostics of Classifiers-Additional classification methods, Time series Analysis, overview of Time series analysis-ARIMA Model-Additional methods, Text Analysis-Text analysis steps-A text analysis Example-Collecting raw Text-Representing Text-Term Frequency—Inverse document frequency(TFIDF)-Categorizing documents by Topics-Determining Sentiments-Gaining insights

UNIT-V
Analytics for Unstructured data-The Hadoop Ecosystem-NoSQL, In-Database Analytics-SQL Essentials-In-Database Text Analysis-Advanced SQL

Course Outcomes:

After Completion of the course the student will be able to
1. Understand the big data concepts
2. Utilize and apply the Analytical methods, Technology and tools in the industry.
3. Understand hadoop ecosystem and apply to solve real-life problems
4. Design efficient algorithms for mining the data from large volumes

TEXTBOOKS:

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.

2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2									1	
CO2	3			2	2								2
CO3	2		2		2								
CO4	3			2			2					2	
CO5													2

3- High mapping   2-Medium Mapping   1- Low Mapping

Sri Venkateswara College of Engineering and Technology
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M.TECH- I Semester CSE (DS)

L	T	P	C
3	0	0	3

20BDS06   DATA PREPARATION AND ANALYSIS
(Professional Elective- II)

Course Objectives:
The objectives of this course are to
1. Understanding the Data formats, parsing and transformation.
2. Analyze data cleaning and segmentation.
3. Describe an analytic approach of clustering and visualization methods.
4. Define appropriate boundaries for the visualization using R analysis.

UNIT -I

Data Gathering and Preparation: Data formats, parsing and transformation, Scalability and real-time issues

UNIT- II

Data preprocessing, Data Cleaning: Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation

Unit -III

Exploratory Analysis: Descriptive and comparative statistics, Clustering and association, Hypothesis generation

UNIT -IV

Visualization: Designing visualizations, Time series, Geolocated data, Correlations and connections, Hierarchies and networks, interactivity

UNIT -V

Visualizations using R

Course Outcomes:
After Completion of the course the student will be able to
1. Apply the data parsing and transformation.
2. Solve by using various data cleaning techniques.
3. Apply clustering and visualization methods
4. Analyze the various methods for the visualization using R.

TEXT BOOKS:
1. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 20014.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3						2		1			1	
CO2	2						2		1				1
CO3	2						2		2			2	
CO4	2						2		2				

3- High mapping　　　**2-Medium Mapping**　　　**1- Low Mapping**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- II Semester CSE (DS)   **L T P C**
                                                          3 0 0 3

20BDS07   DATA SECURITY AND ACCESS CONTROL

(Professional Elective- II)

Course Objectives:

The objectives of this course are to
1. Provide fundamentals of database security and various access control techniques mechanisms.
2. Understand and implement classical models and algorithms.
3. Analyze the data and identify the problems.
4. Choose the relevant models and algorithms to apply according to problem.
5. Assess the strengths and weaknesses of various access control models and to analyse their behavior.

UNIT I

Overview of Access Control: Introduction to Access Control, Purpose and fundamentals of access control, brief history, Policies of Access Control, Models of Access Control, and Mechanisms, Discretionary Access Control (DAC), Non- Discretionary Access Control, Mandatory Access Control (MAC). Capabilities and Limitations of Access Control Mechanisms: Access Control List (ACL) and Limitations, Capability List and Limitations.

UNIT II

Role-Based Access Control (RBAC): Role-Based Access Control (RBAC) and Limitations, Core RBAC, Hierarchical RBAC, Statically Constrained RBAC, Dynamically Constrained RBAC, Limitations of RBAC. Comparing RBAC to DAC and MAC Access control policy.

UNIT III

Models: Biba's integrity model, Clark-Wilson model, Domain type enforcement model, mapping the enterprise view to the system view, Role hierarchies- inheritance schemes, hierarchy structures and inheritance forms, using SoD in real system Temporal Constraints in RBAC, MAC AND DAC. Integrating RBAC with enterprise IT infrastructures: RBAC for WFMSs, RBAC for UNIX and JAVA environments Case study: Multi-line Insurance Company

UNIT IV

Smart card: Smart Card based Information Security, Smart card operating system fundamentals, design and implantation principles, memory organization, smart card files, file management, atomic operation, smart card data transmission ATR, PPS Security techniques- user identification, smart card security, quality assurance and testing, smart card life cycle-5 phases, smart card terminals.

UNIT V

Recent trends: Recent trends in Database security and access control mechanisms. Case study of Role-Based Access Control (RBAC) systems. Recent Trends related to data security management, vulnerabilities in different DBMS.

Course Outcomes:
After Completion of the course the student will be able to
1. Distinguish between the applications database security and various access control techniques mechanisms.
2. Apply advanced relevant models and algorithms to solve the real world problems.
3. Understand the significance of access control techniques mechanisms.
4. Formulate and solve problems by using analyze their behavior.
5. Analyze case studies.

TEXT BOOKS:

1. David F, Ferraiolo D, Richard K, and Chandramouli R, *Role Based Access Control*, (2e), Artech House, ISBN: 9781596931138, 2007.

REFERENCE BOOKS:

1. http://www.smartcard.co.uk/tutorials/sct-itsc.pdf: Smart Card Tutorial.
2. Gerardus B, Role Based Access Control: A Complete Guide, - 2020 Edition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2						3		1				
CO2	3						2		3			1	
CO3	2						2		3				
CO4	2						2		3				2
CO5	3						2					2	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE (DS)   **L   T   P   C**
                                                       3   0   0   3

20BDS08   **WEB AND TEXT ANALYTICS**

(Professional Elective- II)

Course Objectives:
The objectives of this course are to
1. Provide overview and the need for web analytics.
2. Expose to the fundamentals how web analysis.
3. Give the measuring strategy and effects of web analytics
4. Identify the various types of testing and reporting methods.
5. Describe the metrics to analyze the web data
6. Provide exposure to usage of web analytic tools.

UNIT-I

INTRODUCTION TO WEB ANALYTICS: Web analytics approaches –Web analytics works: page tagging, metrics and dimensions, Interaction with data- Goals

UNIT-II

WEB ANALYTICS: Learning about user through web analytics: Visitor Analysis – Traffic analysis – Analyzing how people use you content – Click-path analysis.

UNIT-III

MEASURING THE EFFECTS: Segmentation – Paring the data with UX methods –

Measuring the effects of changes: types of changes. Measuring behavior within pages.

UNIT-IV

TEXT ANALYTICS: Text analytics and text mining - Future of text mining - Practice areas of text analytics - Finding the appropriate solution to a problem - Visualizing the domains of text analytics.

UNIT-V

CLUSTERING: Text Capturing, sorting, sifting, stemming and matching – word cloud, wordless and beyond –Clustering document using words – sentiment and counting.

Course Outcomes:
After Completion of the course the student will be able to

1. Explore Knowledge in web data.
2. Describe the knowledge of various types of testing
3. Study real-time websites for enhancing business performance.
4. Describe the knowledge on clustering in text analysis.
5. Predict the future using text analytics.
6. Analyze the techniques for text and web analytics.

REFERENCES

1. Michael Beasley "Practical Web Analytics for User Experience" ,Elsevier ,ISBN :978-0-12-404619-1,2013.
2. Brian Clifton, "Advanced Web Metrics with Google Analytics", 3rd Edition, Sybex , ISBN-10: 1118168445 , 2012.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3								3				2
CO2	1						2		2			2	
CO3	3												
CO4	3								1				1
CO5	1						2		3		2		

3- High mapping   2-Medium Mapping   1- Low Mapping

Sri Venkateswara College of Engineering and Technology
(Autonomous)

M.TECH- I Semester CSE (DS)   **L   T   P   C**
                                                   2   0   0   2

20BMB21   **RESEARCH METHODOLOGY**

Course Objectives:
   The objectives of this course are to
   1. Introduce the students to concepts, objectives, and process of research.
   2. Enable the students to formulate research problems and develop a coherent research design.
   3. Introduce the students to instruments of data collection, tools for data analysis, and help them draw meaningful interpretations.
   4. Enable the students to prepare research reports.

UNIT-I:

Research: Meaning, Objective, Motivation in Research, Types of Research, Research Approaches, Research Process; Validity and Reliability in Research; Research Design: Features of Good Design, Types of Research Design, and Basic Principles of Experimental Design

.

UNIT-II: Sampling Design: Meaning, Steps in Sampling Design, Characteristics of a Good Sample Design, Random Samples and Random Sampling Design; Measurement and Scaling Techniques: Errors in Measurement, Tests of Sound Measurement, Scaling and Scale Construction techniques, Forecasting Techniques, Time Series Analysis, Interpolation and Extrapolation.

UNIT-III: Methods of Data Collection: Primary Data, Questionnaire and Interviews, Collection of Secondary Data, Cases and Schedules. Professional Attitude and Goals, Concept of Research Excellence, Ethics in Science and Engineering, Frauds in Science and Research.

UNIT-IV: Correlation and Regression Analysis, Method of Least Squares, Regression Vs. Correlation, Correlation Vs. Determination, Types of Correlation and Their Specific Applications; Statistical Interference: Tests of Hypothesis, Parametric Vs. Non-Parametric Tests, Procedure for Testing Hypothesis, Use Statistical Techniques for Testing Hypothesis, Sampling Distribution, Sampling T Chi-Square Test, Analysis of Variance and Covariance, Multivariable Analysis

UNIT V: interpretation of Data and Report Writing, Layout of a Research Paper, Techniques o f Interpretation. Making Scientific Presentation at Conferences and Popular Lectures to Semi Technical Audience, Participating in Public Debates on Scientific Issues.

Course Outcomes:

After Completion of the course the student will be able to

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

1. Explain the concepts, objectives, and process of research (Understanding).

2. Formulate the research problem and develop a sufficiently coherent research design (Creating).

3. Identify the measuring and scaling procedure used in research (Applying).

4. Use statistical tools for descriptive and inferential analysis (Applying).

5. Outline the key elements of report writing (Remembering).

TEXT BOOKS:

1. Garg, C. K. (2019). Research Methodology: Methods And Techniques (4 ed.). New Delhi: New Age International Publisher.
2. Bhattacharyya, D. K. (2006). Research Methodology (2 ed.). New Delhi: Excel Books.
3. O.R.Krishnaswamy and D.Obul Reddy,(2009),Research Methodology and Statistical Analysis, Himalaya Publication,(2nd Edition)

MAPPING COs WITH POs:

COURSE OUTCOMES	PROGRAM OUTCOMES										
	1	2	3	4	5	6	7	8	9	10	11
CO1				2	3					1	
CO2				2	3					2	
CO3					3					2	
CO4				2	3					1	
CO5				2	2						
3- High Mapping 2-Medium Mapping 1- Low Mapping											

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M.TECH- I Semester CSE (DS)   **L T P C**
                                                 0 0 4 2

20BDS09   **DATA SCIENCE LAB-I**

Course Objectives:
The objectives of this course are to
1. write, run and execute python programs.
2. Implement programs with types, operators and expressions in python
3. Use functions and OOPS concepts in python
4. Write, run and execute R programming and to do graphics with it.
5. Visualize structured data, unstructured data, 3D volume plots, data on top of map
6. Create visually appealing network graph, data over geo-map, data visualization process and an interactive model evaluating visualization.
7. Simulate and animate Visualization of Brownian motion

LIST OF EXPERIMENTS

1. a) Write a program to print all the Disarium numbers between 1 and 100.
   b) Write a program to encrypt the text using Caesar Cipher technique. Display the encrypted text. Prompt the user for input and the shift pattern.

2. Devise a program to implement the Rock-Paper-Scissor game

3. Write a program to perform Jump Search for a given key and report success or failure. Prompt the user to enter the key and a list of numbers.

4. The celebrity problem is the problem of finding the celebrity among n people. A celebrity is someone who does not know anyone (including themselves) but is known by everyone. Write a program to solve the celebrity problem.

5. Write a program to construct a linked list. Prompt the user for input. Remove any duplicate numbers from the linked list.

6. Perform the following file operations using Python/R
   a) Traverse a path and display all the files and subdirectories in each level till the deepest level for a given path. Also, display the total number of files and subdirectories.
   b) Read a file content and copy only the contents at odd lines into a new file.

7. Create a menu drive program with a dictionary for words and their meanings. Write functions to add a new entry (word: meaning), search for a particular word and retrieve meaning, given meaning find words with the same meaning, remove an entry, display all words sorted alphabetically.

8. Using Regular Expressions, develop a program to
   a)   Identify a word with a sequence of one upper case letter followed by lower case letters.
   b)   Find all the patterns of "1(0+)1" in a given string.
   c)   Match a word containing 'z' followed by one or more o's.
   Prompt the user for input.

9. Devise a program to implement the Hangman Game

10. Visualize structured data (one, two and multi-dimensional) in Python

11. DATA PRE-PROCESSING AND DATA CUBE

Data preprocessing methods on student and labor datasets Implement data cube for data warehouse on 3-dimensional data

12. EXPLORATORY ANALYSIS

Develop k-means and MST based clustering techniques, Develop the methodology for assessment of clusters for given dataset.

13. DATA CLEANING

Implement various missing handling mechanisms, Implement various noisy handling mechanisms

Course Outcomes:

After Completion of the course the student will be able to

1. use types, operators and expressions in python programing to solve problems.
2. use OOPS concepts in python programming
3. create graphics like plots with R programming
4. Use Data preprocessing and apply to real world data

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	1	2			1						
CO2	2	2											2
CO3	2	3	2				1					1	2
CO4	3								3				2

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- I Semester CSE (DS)   **L   T   P   C**
                                                         0   0   4   2
20BDS10   DATA SCIENCE LAB-II

Course Objectives:
The objectives of this course are to
1. Understand how to validate, query and visualize tremendous amounts of information.
2. Learn Basic Data analytic methods using R
3. Get a knowledge on advanced analytical methods, technology and tools

LIST OF EXPERIMENTS

1.   Hadoop Installation
2.   To implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, Retrieving files, Deleting files
3.   To run a basic Word Count MapReduce program
4.   To study and implement basic functions and commands in R Programming.
5.   To perform NoSQL database using mongodb to create, update and insert.
6.   To build WordCloud, a text mining method using R for easy to understand and visualization than a table data.
7.   To implement classification program using R programming.
8.   To implement clustering program using R programming.
9.   To find Term Frequency and Inverse Document Frequency (tf-idf) Matrix for Recommendation Systems and Plot TF Using R used.
10. To finding similar documents with Cosine Similarity in R.

Course Outcomes:
After Completion of the course the student will be able to
1. Prepare for data summarization, query, and analysis
2. Apply data modelling techniques to large data sets
3. Create applications for Big Data analytics
4. Build a complete business data analytic solution

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2									1	
CO2	3			2	2								2
CO3	2		2		2								
CO4	3			2			2					2	
													2

3- High mapping   2-Medium Mapping   1- Low Mapping

M.TECH- I Semester CSE (DS)   **L   T   P   C**
                                         2   0   0   0

20BDS11   ENGLISH FOR RESEARCH PAPER WRITING

(AUDIT COURSE-1)

Course Objectives:
The objectives of this course are to
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title

UNIT I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts.

Introduction

UNIT III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT IV

key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

UNIT V

skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusion useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Course Outcomes:
After Completion of the course the student will be able to
1. Understand that how to improve your writing skills and level of readability

2. Learn about what to write in each section

3. Understand the skills needed when writing a Title

4. Ensure the good quality of paper at very first-time submission

TEXT BOOKS:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
Model Curriculum of Engineering & Technology PG Courses [Volume-I][41]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht
Heidelberg London, 2011

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M.TECH- II Semester CSE (DS)　　　　　　　　　　**L　T　P　C**
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20BDS12　　　　OPTIMIZATION TECHNIQUES

Course Objectives:
The objectives of this course are to
1. Understand inventory model and business replacement problems.
2. Find best method for solving linear programming, Optimization of transport problems.
3. Find solution to convex programming problem, quadratic programming problem.

UNIT I

UNCONSTRAINED OPTIMIZATION: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions.

UNIT II

CONSTRAINED OPTIMIZATION: Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn – Tucker Sufficient Conditions.

UNIT III

OPTIMIZATION: Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg- Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Liner Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Algorithms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches – Blue.

UNIT IV

OPTIMIZATION AND FUNCTIONS OF A COMPLEX VARIABLE AND NUMERICAL ANALYSIS: The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runga-Kutta Method for Ordinary Differential Equations, Gaussian Quardative Tranzoidal Rule and Simpson's 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi's Iteration Method.

UNIT V

OPTIMIZATION IN OPERATION RESEARCH: Dynamic Programming, Transportation – Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming – Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods.

Course Outcomes:

After Completion of the course the student will be able to

1. Understand the overview of optimization techniques, concepts of design space, constraint surfaces and objective function.
2. Review differential calculus in finding the maxima and minima of functions of several variables.
3. Formulate real-life problems with linear programming.
4. Apply dynamic programming to optimize multi stage decision problems.

TEXT BOOKS:

1. Winston W L: (01-Jan-2008) Operations Research: Applications and Algorithms, Thomson Business Press.
2. Singiresu S. Rao, S. S. Rao(2009), Engineering Optimization: Theory and Practice, (4th edition, John Wiley & Sons.

REFERENCE BOOKS:

1. Williams H.P. (2013): Model Building in Mathematics Programming, (5th ed.), John Wiley.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3												2	
CO2	2													2
CO3							1		3					
CO4							2		3		2		2	

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- II Semester CSE (DS)   **L   T   P   C**
                                          3   0   0   3

20BCS13   **MACHINE LEARNING**

Course Objectives:
The objectives of this course are to
1. Acquire theoretical Knowledge on setting hypothesis for pattern recognition.
2. Apply suitable machine learning techniques for data handling and to gain knowledge from it
3. Evaluate the performance of algorithms and to provide solution for various real-world applications.

UNIT I

INTRODUCTION TO MACHINE LEARNING: Introduction, Examples of Various Learning Paradigms, Version Spaces, VC Dimension, Relevant Resources.

UNITII

SUPERVISED LEARNING: Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm.

BAYESIAN DECISION THEORY: Introduction, Classification, Losses and Risks, Discriminant Functions, Association Rules.

UNITIII

UNSUPERVISED LEARNING: Introduction to clustering, K-means clustering, Expectation Maximization Algorithm, Mixtures of Latent variable Models, Supervised Learning after Clustering, Spectral Clustering, Hierarchical Clustering.

UNIT IV

GRAPHICAL MODELS: Introduction, Canonical Cases for Conditional Independence, Generative Models, Belief Propagation. Undirected Graphs: Markov Random Fields, Learning the Structure of a Graphical Model, Influence Diagrams.

UNIT V

REINFORCEMENT LEARNING: Introduction, Elements of Reinforcement Learning, Model-Based Learning, Temporal Difference Learning, Generalization, Partially Observable States

Course Outcomes:
After Completion of the course the student will be able to
1. Recognize the characteristics of Machine Learning techniques that enable to solve real world problems.
2. Recognize the charecteristics of machine learning strategies.
3. Apply various supervised learning methods to appropriate problems.
4. Identify and integrate more than one technique to enhance the performance of learning.
5. Create probabilistic and unsupervised learning models for handling unknown pattern .

6. Analyze the co-occurrence of data to find interesting frequent patterns.

TEXT BOOKS:

1. Ethem Alpaydin," Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third TEXT BOOKSEdition2014.
2. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
3. Tom M Mitchell, ―Machine Learning‖, First Edition, McGraw Hill Education, 2013.

REFERENCE BOOKS:

1. Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.
2. Jason Bell, ―Machine learning – Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014 .

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3						2		2				2
CO2	3						2		3				3
CO3	2						2		3			1	
CO4	2						2		3				
CO5	3						1		1				
CO6	2						2		3			2	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- II Semester CSE (DS)　　　　　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　0　0　3
20BCS14　　MULTIVARIATE TECHNIQUES FOR DATA ANALYSIS
(Professional Elective- III)

Course Objectives:
The objectives of this course are to
1. Data characteristics and form of Distribution of the Data Structures.
2. Understanding the usage of multivariate techniques for the problem under the consideration.
3. For drawing valid inferences and to plan for future investigations.

UNIT I - INTRODUCTION TO MULTIVARIATE ANALYSIS

Meaning of Multivariate Analysis, Measurements Scales - Metric measurement scales and Non metric measurement scales, Classification of multivariate techniques (Dependence Techniques and Inter-dependence Techniques), Applications of Multivariate Techniques in different disciplines.

UNIT II – FACTOR ANALYSIS

Factor Analysis: Meanings, Objectives and Assumptions, Designing a factor analysis, Deriving factors and assessing overall factors, Interpreting the factors and validation of factor analysis.

UNIT III – CLUSTER ANALYSIS

Cluster Analysis: Objectives and Assumptions, Research design in cluster analysis, Deriving clusters and assessing overall fit (Hierarchical methods, Non Hierarchical Methods and Combinations), Interpretation of clusters and validation of profiling of the clusters.

UNIT IV - DISCRIMINANT ANALYSIS (9 hours)

Discriminant Analysis- concept, objective and applications. Procedure for conducting discriminant analysis. Stepwise discriminate analysis and Mahalanobis procedure. Logit model.

UNIT V – LINEAR PROGRAMMING (9 hours)

Linear Programming problem - Formulation, graphical method, simplex method. Integer Programming. Transportation and Assignment problem.

Course Outcomes:

After Completion of the course the student will be able to

1. Understand and Apply various Multivariate Techniques in different disciplines.
2. Explain what multivariate analysis is and when its application is appropriate.
3. Discuss the nature of measurement scales and their relationship to multivariate techniques.
4. Define the specific techniques included in multivariate analysis.
5. Determine which multivariate technique is appropriate for a specific research problem.
6. Understand the six-step approach to multivariate model building

TEXT BOOKS:

1. Joseph F Hair, William C Black etal , "Multivariate Data Analysis" , Pearson Education,7th edition, 2013.
2. T. W. Anderson , "An Introduction to Multivariate Statistical Analysis, 3rd Edition", Wiley,2003.
3. William r Dillon, John Wiley & sons, "Multivariate Analysis methods and applications", Wiley, 1984.
4. Naresh K Malhotra, Satyabhusan Dash, "Marketing Research Anapplied Orientation",Pearson, 2011.
5. Hamdy A Taha, "Operations Research", Pearson, 2012.
6. S R Yaday, A K Malik, "Operations Research", Oxford, 2014.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2			2							
CO2	3	2		2		2							
CO3	2	3		2			2						
CO4	3												
CO5	3	2	2	3									
CO6	3		3		2	2							

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- II Semester CSE (DS)　　　　　　　　　**L　T　P　C**

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20BDS15　　　　　　　　　**SECURITY IN CLOUD**

(Professional Elective- III)

Course Objectives:
The objectives of this course are to
1. Appraise the students with basic knowledge on security issues from the cloud Providers and users perspective.
2. Teach a student how to secure private and public cloud.
3. Explain students how to develop a prototype for cloud security.

UNIT -I
Introduction: Review of cloud platforms and architectures Security issues from the cloud providers perspective, users perspective understanding security and privacy - Cloud Computing risk issues.

UNIT- II
Securing the cloud: Security challenges -Security requirements for the architecture-Securing private and public clouds Security patterns- Cloud security architecture-Infrastructure security.

UNIT -III
Security Protocols and Standards: Host security, Compromise response, Security standards Message Level Security (MLS), Transport Level Security, OAuth,OpenID,eXtensible Access Control Markup Language (XACML), and Security Assertion Markup Language (SAML).

UNIT- IV
Strategies and Practice: Strategies and best practices Security controls: limits, best practices, monitoring Security criteria - assessing risk factors in Clouds.

UNIT -V
Security management in the cloud: Security management in the cloud: SaaS, PaaS, IaaS availability management Security as a service-

Trust Management for Security.

Course Outcomes:
After Completion of the course the student will be able to
1. Comprehend the basics of cloud platforms and risk issues in cloud computing.
2. Describe cloud security architecture, challenges and requirements.
3. Understand the functionalities of security protocols.
4. Identifying best practices and strategies for a secure cloud environment.
5. Illustrate how to perform security analytics in cloud platform

TEXT BOOKS:

1. Ronald L. Krutz , Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud computing, Wiley 2010.
2. Securing the Cloud: Cloud Computer Security Techniques and Tactics, by Vic (J.R) Winkler, Elseiver 2011.

REFERENCE BOOKS:

1. Ben Halpert , Auditing Cloud Computing: A Security and Privacy Guide:, John Wiley Sons, 2011.

2. Ianlim, E.Coleen Coolidge, Paul Hourani, Securing Cloud and Mobility: A Practitioners Guide, Auerbach Publications, Feb 2013.

3. Pethuru Raj, Cloud Enterprise Architecture, CRC Press, 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3						2						2
CO2	2											1	
CO3	2						2		2				
CO4	2						2		3			1	
CO5	1						2		3				2

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- II Semester CSE (DS)   **L T P C**
                                                    3 0 0 3

20BDS16   **IMAGE AND VIDEO ANALYTICS**

(Professional Elective- III)

Course Objectives:

The objectives of this course are to
1. Impart knowledge on the basic principles and concepts in digital image processing.
2. Explore the application of image analysis towards image interpretation.
3. Apply mathematics and science in engineering applications.
4. Understand the subject related concepts and of contemporary issues.

UNIT- I

Fundamentals of Image Processing and Image Transforms: Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels. Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT -II

Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, Image smoothing, Image sharpening, Selective filtering.

UNIT- III

Image Compression: Image compression fundamentals – Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

UNIT- IV

Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, filtering operations.

UNIT -V

2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

Course Outcomes:

After Completion of the course the student will be able to
1. Apply principles and techniques related to imaging system.
2. Acquire an appreciation for the image processing issues and techniques.

3. Conduct independent study and analysis of image processing methods.
4. Get broad exposure of image processing in industry, medicine and defence.

TEXT BOOKS:

1. Gonzaleze and Woods, "Digital Image Processing", 3rd Edition, Pearson.
2. Yao Wang, Joem Ostermann and Ya–quin Zhang, "Video Processing and Communication",1st Edition, PH Int.

REFRENCE BOOKS:

1. Gonzaleze and Woods, "Digital Image Processing using MATLAB", 2nd Edition, McGraw Hill Education, 2010.
2. Milan Sonka, Vaclan Hlavac, "Image Processing Analysis , and Machine Vision", 3r Edition, CENGAGE, 2008.
3. A Murat Tekalp, "Digital Video Processing", PERSON, 2010.
4. S.Jayaraman, S. Esakkirajan, T. Veera Kumar, "Digital Image Processing", TMH, 2009.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3						2		1			2	
CO2	2						1		3				
CO3	3	1					2		2				2
CO4	3								1			2	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- II Semester CSE(DS)　　　　　　　　　　**L　T　P　C**
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20BDS17DATA STORAGE TECHNOLOGIES AND NETWORKS
(Professional Elective- IV)

Course Objectives:
The objectives of this course are to
1. Understand the various storage media and technologies.
2. Describing the memory Hierarchy and performance issues.
3. Elaborate the different large storage devices and its Architecture.
4. Understanding Storage Area Networks.

UNIT I

Storage Media and Technologies – Magnetic, Optical and Semiconductor Media, Techniques for

read/write Operations, Issues and Limitations.

UNIT II

Usage and Access – Positioning in the Memory Hierarchy, Hardware and Software Design for Access,

Performance issues.

UNIT III

Large Storages – Hard Disks, Networked Attached Storage, Scalability issues, Networking issues.

UNIT IV

Storage Architecture - Storage Partitioning, Storage System Design, Caching, Legacy Systems.

UNIT -V

Storage Area Networks – Hardware and Software Components, Storage Clusters/Grids.

Storage QoS– Performance, Reliability, and Security issues, storage appliances.

Course Outcomes:
After Completion of the course the student will be able to
1. Analyze the various storage media and technologies andLearn Storage System Architecture
2. Identify the performance issues of memory and network.
3. Understand the different large storage devices and its Architecture.
4. Understanding security, QoS and its Storage of cluster and Grids

TEXTBOOKS:

1. The Complete Guide to Data Storage Technologies for Network-centric Computing,
Computer Technology Research Corporation, 1998.
REFERENCE BOOKS:

1. Nigel Poulton, Data Storage Networking: Real World Skills for the CompTIA Storage,
Sybex, Wiley, 2014

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3		2									1	
CO2	3			2	2								2
CO3	2		2		2								
CO4	3			2			2					2	
CO5													2

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- II Semester CSE (DS)   **L   T   P   C**
                                                    3   0   0   3

20BDS18   **BIG DATA SECURITY**
                              (Professional Elective- IV)

Course Objectives:
The objectives of this course are to
1. Understanding significance of privacy, ethics in big data environment
2. Analyzing the steps to secure big data
3. Building security in Hadoop environment and its ecosystem.
4. Analyzing data security and event logging

UNIT I – BIG DATA PRIVACY, ETHICS AND SECURITY

Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self regulating? – Ethics

– Ownership – Ethical Guidelines – Big Data Security – Organizational Security.

UNIT II - SECURITY, COMPLIANCE, AUDITING, AND PROTECTION

Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual

Property Challenge – Research Questions in Cloud Security – Open Problems.

UNIT III – HADOOP SECURITY DESIGN

Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation &

Configuration.

UNIT IV – HADOOP ECOSYSTEM SECURITY

Configuring Kerberos for Hadoop ecosystem components – Pig, Hive, Oozie, Flume, HBase, Sqoop.

UNIT V – DATA SECURITY & EVENT LOGGING

Integrating Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM

system – Setting up audit logging in hadoop cluster

Course Outcomes:
After Completion of the course the student will be able to
1. Understand the building blocks of Big Data
2. Articulate the programming aspects of cloud computing(map Reduce etc)
3. Understand the specialized aspects of big data with the help of different big data applications
4. Represent the analytical aspects of Big Data
5. Know the recent research trends related to Hadoop File System, MapReduce and Google File System etc

TEXTBOOKS:

1. Mark Van Rijmenam, "Think Bigger: Developing a Successful Big Data Strategy for Your Business", Amazon, 1 edition, 2014.
2. Frank Ohlhorst John Wiley & Sons, "Big Data Analytics: Turning Big Data into Big Money", John Wiley & Sons, 2013.

REFERENCES:

1. Sherif Sakr, "Large Scale and Big Data: Processing and Management", CRC Press, 2014.
2. Sudeesh Narayanan, "Securing Hadoop", Packt Publishing, 2013.
3. Ben Spivey, Joey Echeverria, "Hadoop Security Protecting Your Big Data Problem", O'Reilly Media, 2015.
4. Top Tips for Securing Big Data Environments: e-book (http://www.ibmbigdatahub.com/whitepaper/top-tips-securing-big-data-environments-e book)
5. http://www.dataguise.com/?q=securing-hadoop-discovering-and-securing-sensitive-data hadoop-data-stores
6. Gazzang for Hadoop http://www.cloudera.com/content/cloudera/en/solutions/enterprise solutions/security-for-hadoop.html
7. eCryptfs for Hadoop https://launchpad.net/ecryptfs.
8. Project Rhino - https://github.com/intel-hadoop/project-rhino/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3				2	1					1	
CO2	3	3	3	3	2		1					1	2
CO3	3						2						2
CO4				3								2	
CO5	3						2		2				2

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- II Semester CSE (DS)   **L   T   P   C**

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20BDS19   **BUSINESS ANALYTICS**

(Professional Elective- IV)

Course Objectives:

The objectives of this course are to

1.To gain an understanding of how managers use business analytics to formulate and solve business

problems and to support managerial decision making.

2. To become familiar with the processes needed to develop, report, and analyze business data.

3. To learn how to use and apply Excel and Excel add-ins to solve business problem

UNIT I

Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics

Process, Relationship of Business Analytics Process and organisation, competitive advantages of

Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of

probability distribution and data modelling, sampling and estimation methods overview.

Unit II

Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear

Regression. Important Resources, Business Analytics Personnel, Data and models for Business

analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit III

Organization Structures of Business analytics, Team management, Management Issues, Designing

Information Policy, Outsourcing, Ensuring Data Quality, measuring contribution of Business

analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling,

Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its

step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit IV

Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models,

Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear

Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables,

Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle

Simulation Using Analytic Solver Platform, New-Product Development Model, News vendor Model,

Overbooking Model, Cash Budget Model .

Unit V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making, recent Trends in : Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Course Outcomes:

After Completion of the course the student will be able to
1. Understand the big data concepts
2. Utilize and apply the Analytical methods, Technology and tools in the industry.
3. Understand hadoop ecosystem and apply to solve real-life problems
4. Design efficient algorithms for mining the data from large volumes

TEXTBOOKS:

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Business analytics Principles, Concepts, and Applications Pearson FT Press, 2014.

2. James Evans, Business Analytics, Pearson Education, 2013.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3											1	
CO2							3		2				2
CO3	3						2		3				
CO4							3		2			1	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- II Semester CSE (DS)

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(20BCS20)   **MINI PROJECT**

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M.TECH- II Semester CSE (DS)   **L T P C**
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20BDS21   **DATA   SCIENCE LAB-III**

Course Objectives:
The objectives of this course are to
1.The basic concepts and techniques of Python Libraries used for Machine Learning.
2. The preprocessing of data in Python.
3. The implementation of Regression methods, classification methods, clustering methods.

LIST OF EXPERIMENTS

1.Introduction to Python Libraries- Numpy, Pandas, Matplotlib, Scikit

2. Perform Data exploration and preprocessing in Python

 3. Implement regularised Linear regression

4. Implement Naive Bayes classifier for dataset stored as CSV file.

5. Implement regularized logistic regression

6. Build models using different Ensembling techniques

 7. Build models using Decision trees

 8. Build model using SVM with different kernels

9. Implement K-NN algorithm to classify a dataset.

 10. Build model to perform Clustering using K-means after applying PCA and determining the

value of K using Elbow method.

Course Outcomes:

After Completion of the course the student will be able to
        1.Gain knowledge about Python Librarie and implementation for Machine Learning
        2. Identify machine learning techniques suitable for a given problem
        3.Solve the problems using various machine learning techniques
        4.Design application using machine learning techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2									1	
CO2		3		2	2								2
CO3		3		3	3							2	
CO4				3	2							2	3

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- II Semester CSE (DS)   **L   T   P   C**
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20BDS22   **DATA   SCIENCE LAB-IV**

Course Objectives:

The objectives of this course are to
1.   The basic principles and concepts of Python
2.   Various optimization techniques like LPP models.
3.   How to analyze the transportation, inventory and assignment problems.
4.   The concepts of sequencing, game theory and dynamic programming

LIST OF EXPERIMENTS

1.   Matrix Operations

2.   Matrix Operations

3.   Minimum Cost Path

4.   Finding Maximum Number In An Array

5.   Array Sorting

6.   Linear Programming Problem

7.   Queuing Problem

8.   Sequencing Problem

9.   Game Theory

10. Assignment Problem

11. Inventory Problem

12. Examinations

Course Outcomes:
After Completion of the course the student will be able to
 1.Understand the basic principles and concepts of Python
 2. Explore the applicability of programming skills in Python.
 3.Summarize various optimization techniques like LPP models .
 4.Analyze the transportation, inventory and assignment problems.
 5. Explain the concepts of sequencing, game theory and dynamic programming.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3								3				2
CO2	1		1				2		2			2	
CO3		2											
CO4	3								1				1
CO5	1						2		3		2		

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- II Semester CSE (DS)　　　　　　　　**L　T　P　C**
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20BDS23　　　　　**VALUE EDUCATION**
　　　　　　　　　　　　(AUDIT COURSE-2)

Course Objectives:

The objectives of this course are to
1.Understand value of education and self- development.
2. Imbibe good values in students.
3. Let the should know about the importance of character.

UNIT- I

Values and self-development –Social values and individual, attitudes. Work ethics, Indian vision of

humanism, Moral and non- moral valuation. Standards and principles, Value judgements

UNIT- II

Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence,

Concentration. Truthfulness, Cleanliness, Honesty, Humanity. Power of faith, National Unity,

Patriotism. Love for nature, Discipline.

UNIT- III

Personality and Behavior Development - Soul and Scientific attitude., Positive Thinking. Integrity and

discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour.

UNIT- IV

Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth,

Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.

UNIT -V

Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of

reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message,

Mind your Mind, Self-control, Honesty, Studying effectively

Course Outcomes:
After Completion of the course the student will be able to
1. Familiar with the design process to develop visualization methods and visualization systems, and methods for their evaluation.
2. Preparation and processing of data, visual mapping and the visualization
3. Have an understanding of large-scale abstract data

TEXT BOOKS:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd.

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M.TECH- III Semester CSE (DS)   **L   T   P   C**

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20BDS24   **DATA VISUALIZATION**

(Professional Elective- V)

Course Objectives:

The objectives of this course are to

1. Understand the basic and advanced techniques of information visualization and scientific visualization
2. Learn key techniques of the visualization process
3. Learn a detailed view of the visualized data, the actual visualization and visual perception, interaction and distorting techniques

UNIT- I

Introduction of visual perception, History of visualization, visual representation of data, Gestalt principles, information overloads in visualization. Visualization reference model, visual mapping, visual analytics, visualization applications design.

UNIT- II

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT- III

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization

UNIT- IV

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, Evaluating visualizations.

UNIT -V

Recent trends in various perception techniques, various visualization techniques, data structures used in data visualization.

Course Outcomes:

After Completion of the course the student will be able to

1. Familiar with the design process to develop visualization methods and visualization systems, and methods for their evaluation.
2. Preparation and processing of data, visual mapping and the visualization
3. Have an understanding of large-scale abstract data

TEXT BOOKS:

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd.

REFERENCE BOOKS:

1. E. Tufte, The Visual Display of Quantitative Information, Graphics Press

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			2							1	
CO2	3	2	2			2							
CO3	3	2		2									2
CO4												1	
CO5													2

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- III Semester CSE (DS)　　　　　　　　**L　T　P　C**

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20BDS25　　　　　　　　**RISK ANALYTICS**

(Professional Elective- V)

Course Objectives:

The objectives of this course are to

1. understand the functioning of Banking and apply analytic techniques to mitigate risks
2. understand the operations of Insurance sector and apply analytic techniques to mitigate risks and improve profitability.
3. understand the processes involved in Healthcare industry and use data analysis to improve patient care and optimize cost
4. understand human relationship management techniques for effective management of people

UNIT I - INTRODUCTION

Risk – Definition and Examples, Components and Factors; Understanding Risk Assessment, Risk Mitigation and Risk Management; Risk Analytics- Definition and Objectives.

UNIT II - RISK ANALYTICS FOR BANKING DOMAIN

Introduction to Banking Sector; National and International laws; Credit Risk Analytics , Internal capital Adequacy Assessment Process related Risk Analytics , Limit Management , Risk-Adjusted Performance Management ,Fraud Risk; Case Studies

UNIT III - RISK ANALYTICS FOR INSURANCE DOMAIN

Introduction to Insurance Sector; Property & Causality Insurance Companies and Life Insurance Companies; Using Analytics for Customer Acquisition and Retention; Detecting, Preventing and Managing Fraud using Analytics; Case Studies

UNIT IV - RISK ANALYTICS FOR HEALTHCARE DOMAIN

Introduction to Healthcare Sector; HIPAA, Four Enterprise Disciplines of Health Analytics, Health Outcome Analysis, Health Value and Cost; Customer Insights, Actuary Services, Framework for Customer Analytics; Risk Management

UNIT V - WORKFORCE ANALYTICS

Workforce Environment and Psychology, HR Analytics and Talent Management- Understanding and Predicting Retention, Boosting Employee Engagement, Sources of Hire and Quality of Hire, Profiling High Performers

Course Outcomes:

After Completion of the course the student will be able to

1. Understanding Risk Assessment, Risk Mitigation and Risk Management; Risk Analytics

2. Apply analytic techniques to mitigate risks
3. Understand the operations of Insurance sector and apply analytic techniques to mitigate risks
4. Examine the Risk analysis Healthcare industry and use data analysis to improve patient care and optimize cost
5. Analyze various human relationship management techniques for effective management of people

TEXTBOOKS:

1. Clark Abrahams and Mingyuan Zhang, "Credit Risk Assessment: The New Lending System for Borrowers, Lenders, and Investors", ISBN 978-0-470-46168-6

2. Naeem Siddiqi, "Credit Risk Scorecards: Developing and Implementing Intelligent Credit Scoring", ISBN 978-0-471-75451-0

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			2								
CO2	3	2	2			2							
CO3	3	2		2		2							
CO4	3			2		2							
CO5	3	2			2		2						

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- III Semester CSE (DS)　　　　　　　　**L　T　P　C**
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20BDS26　　　　　　**SOCIAL NETWORK ANALYSIS**

(Professional Elective- V)

Course Objectives:
The objectives of this course are to

1. Understand the development of Social Network analysis and Graph theory.
2. Plan and execute Various Relational Data.
3. Use advanced network analysis software to generate visualizations and perform empirical investigations of network data.
4. Understand the different cluster concept.
5. Study the concept of Network Structure and advances of visualization.

UNIT -I

Networks and Relations, Relations and Attributes, Analysis of Network Data, Interpretation of Network Data, An Overview. The Development of Social Network Analysis, Sociometric analysis and Graph Theory, Interpersonal Configurations and cliques.

UNIT II

Analyzing Relational Data, Collecting Relational Data, Selection and Sampling of Relational Data, Preparation of Relational Data, Organizing Relational Data. Lines, Neighbourhoods and Densities, Socio metric and Graph Theory, Density: Ego-centric and Socio-centric, A Digression on absolute density, Community Structure and density

Unit III

Centrality Peripherality and Centralization, Centrality: Local and Global, Centralization and Graph Centres, bank Centrality in Corporate Networks, Components, Cores and Cliques, Components, Cycles and Knots, The Contours of components, Cliques and their intersections

UNIT IV

Positions, sets and clusters, the structural equivalence of points, Clusters: Combining and dividing points, Block Modeling with CONCER, Towards Regular Structure Equivalence

UNIT V

Network Dynamics and Change over Time, Modelling change in Network Structure, Testing Explanations. Dimensions and displays, Distance, space and metrics, principal components and factors, Non-metric methods, Advances in Network Visualization, Elites, Communities and influence. Accessing twitter

Course Outcomes:

After Completion of the course the student will be able to

1. Develop the Social Network analysis and its application.
2. Analyze the Various Relational Data.
3. Design software for network visualizations.
4. Evaluate different approaches of cluster concept.
5. Understand the advances in Network visualization.

TEXTBOOKS:

1. John Scott, Social Network Analysis, 3/e, SAGE Publications, 2017
2. Matthew A. Russell, Mining the Social Web, 2/e, O'Reilly Media, 2011.

REFERENCE BOOKS:

1. Charles Kadushin, Understanding Social Networks: Theories, Concepts, and Findings, Oxford University Press, 2012.
2. Maksim Tsvetovat, Alexander Kouznetsov, Social Network Analysis for Startups, O'Reilly, 2014.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3				2	2						1	2
CO2		3	2		2	2						1	
CO3		2	3		2								2
CO4		2	2		3								1
CO5	3		2		2							2	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- III Semester CSE (DS)　　　　　　　　　　**L　T　P　C**
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20BDS27　　　　　**NATURAL LANGUAGE PROCESSING**

(Professional Elective- VI)

Course Objectives:
The objectives of this course are to
1. Understand the fundamental concepts and techniques of Natural language Processing
2. Study of syntactic and semantic analysis of natural language processing.
3. Describing semantic parsing and Language Modeling
4. Understand Machine Translation Models.

UNIT I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models. **Finding the Structure of Documents:** Introduction, Methods, Complexity of the Approaches, and Performances of the Approaches.

UNIT II

Syntax: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense, Predicate-Argument Structure, Meaning Representation.

UNIT IV

Language Modeling: Introduction, n-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model adaptation, Types of Language Models, Language Specific Modeling Problems, Multilingual and Cross lingual Language Modeling.

UNITV

Machine Translation: Machine Translation Today, Machine Translation Evaluation, Word Alignment, Phrase-Based Models, Tree-Based Models, Linguistic Challenges, Tools and Data Resources.

Course Outcomes:
After Completion of the course the student will be able to
1. Apply the techniques of Natural language Processing.
　Analyze the syntactic and semantic correctness of sentences using grammars and　labeling.
2. Select a suitable Languwage Modeling Techniques based on the structure of the language.
3. Designing the appropriate Machine Translation Tools.

TEXT BOOK:

1. Multilingual Natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zaloumi, Pearson Publication.

REFERENCE BOOKS:

1. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2009.
2. NitinIndurkhya, FredJ.Damerau"Handbook of Natural Language Processing", Second Edition, CRC Press,2010.
3. James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			2								
CO2		3			2	2						2	
CO3		2		2	2								1
CO4		3	2	2	2								
CO5												3	

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

M.TECH- III Semester CSE (DS)   **L T P C**
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20BDS28   DECISION MANAGEMENT SYSTEMS

(Professional Elective- VI)

Course Objectives:
   The objectives of this course are to
1. Understanding how Decision Management Systems can transform the business.
2. Planning the systems "with the decision in mind".
3. Identifying, modeling, and prioritizing the decisions.
4. Designing and implementing robust decision services.

UNIT I – PRINCIPLES OF DMS

Principles of Decision Management Systems - Begin with the Decision in Mind - Be Transparent and Agile - Be Predictive, Not Reactive - Test, Learn, and Continuously Improve

UNIT II – BUILDING DECISION MANAGEMENT SYSTEMS

Building Decision Management Systems - Discover and Model Decisions - Characteristics of Suitable Decisions - A Decision Taxonomy - Finding Decisions - Documenting Decisions - Prioritizing Decisions.

UNIT III – DESIGN AND IMPLEMENT DECISION SERVICES

Design and Implement Decision Services - Build Decision Services - Integrate Decision Services - Best Practices for Decision Services Construction - Monitor and Improve Decisions - What Is Decision Analysis? - Monitor Decisions - Determine the Appropriate Response - Develop New Decision-Making Approaches - Confirm the Impact Is as Expected - Deploy the Change.

UNIT IV – ENABLERS FOR DECISION MANAGEMENT SYSTEMS

Enablers for Decision Management Systems - People Enablers - The Three-Legged Stool - A Decision Management Center of Excellence - Organizational Change - Process Enablers - Managing a Decision Inventory - Adapting the Software Development Lifecycle - Decision Service Integration Patterns - Moving to Fact-Based Decisioning - The OODA Loop - Technology
Enablers.

UNIT V – BUSINESS RULES MANAGEMENT SYSTEMS

Business Rules Management Systems - Predictive Analytics Workbenches - Optimization Systems - Pre-Configured Decision Management Systems - Data Infrastructure - A Service Oriented Platform.

Course Outcomes:
After Completion of the course the student will be able to
1. Analyze how Decision Management Systems can be transformed into business.
2. Examine the decision finding and documenting.
3. Apply Identifying, modeling, and prioritizing the decisions.
4. Design and implement robust decision services.
5. Understand Business Rules management systems

TEXT BOOKS:

1. James Taylor, "Decision Management Systems-A Practical guide to using Business rules and Predictive Analytics", IBM Press, 2012.

2. Efraim Turban , Jay E. Aronson , Ting-Peng Liang, "Decision Support Systems & Intelligent Systems", 9th edition, Prentice Hall, 2010.

4. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.

REFERENCES

1. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Wiley, 2013.

2. George M Marakas, "Decision support Systems", 2nd Edition, Pearson/Prentice Hall,2002

3. V.S. Janakiraman, K. Sarukesi, "Decision Support Systems",PHI, ISBN8120314441, 9788120314443, 2004.

4. Efrem G Mallach, "Decision Support systems and Data warehouse Systems", McGraw Hill, thirteenth reprint, 2008.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2		3									2
CO2	3		3		2	2	1					1	
CO3	3	3	3	3								1	
CO4	3	3	2	3		2							2
CO5	3				1		2						2

3- High mapping   **2-Medium Mapping**   **1- Low Mapping**

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M.TECH- III Semester CSE (DS)　　　　　　　**L　T　P　C**
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20BDS29　　　ADVANCED ALGORITHMS

(Professional Elective- VI)

Course Objectives:
The objectives of this course are to
1. Integrate the parallel and sequential algorithms
2. Design and analysis of paradigms for sequential and parallel models.

UNIT I - INTRODUCTION TO ALGORITHMS

Introduction to Preliminaries - Design and Analysis Fundamentals - Mathematical Tools for Algorithm Analysis - Trees and Applications to Algorithms - More on Sorting Algorithms - Probability and Average Complexity of Algorithms.

UNIT II - DESIGN STRATEGIES

Major Design Strategies - The Greedy Method – Divide and Conquer - Dynamic Programming - Backtracking and Branch and Bound.

UNIT III - GRAPH AND NETWORK ALGORITHMS

Graph and Network Algorithms - Graphs and Digraphs - Minimum Spanning Tree and Shortest Path Algorithms - Graph Connectivity and Fault-Tolerance of Networks - Matching and Network Flow Algorithms.

UNIT IV - PARALLEL AND DISTRIBUTED ALGORITHMS

Parallel and Distributed Algorithms - Introduction to Parallel Algorithms and Architectures - Parallel Design Strategies - Internet Algorithms -Distributed Computation Algorithms - Distributed Network Algorithms.

UNIT V – SEARCH ALGORITHMS

String Matching and Document Processing - Balanced Search Trees - The Fast Fourier Transform - Heuristic Search Strategies: A* - Search and Game Trees 24 - Probabilistic and Randomized Algorithms - Lower-Bound Theory - NP-Complete Problems - Approximation Algorithms

Course Outcomes:
After Completion of the course the student will be able to
1. Analyze the complexity and performance of different algorithms.

2. Apply the various problem solving techniques for the real time applications.

3. Determine the appropriate network algorithm for solving a particular set of problems

4. Evaluate and Perform hypothesis testing and to conclude

5. Design and build solutions for a real world problem by applying relevant distributions

TEXT BOOKS

1. Kenneth A. Berman, Jerome L. Paul , "Algorithms: Sequential, Parallel, and Distributed", Amazon Bestsellers, 2004.

2. Russ Miller, Laurence Boxer, "Algorithms Sequential and Parallel: A Unified Approach", Prentice Hall, 1 edition, 1999.

3. Dimitri P. Bertsekas and John N. Tsitsiklis, "Parallel and Distributed Computation: Numerical Methods", Prentice Hall, 1989.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		3			2					1	
CO2	2	3	3	3	3	2	2			1			3
CO3	3	2		2		3	2					2	
CO4	2	2	3	3		2	1						1
CO5	3	3	3	3	3	3	2						3

3- High mapping   2-Medium Mapping   1- Low Mapping

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M.TECH- III Semester CSE (DS)   **L T P C**

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20BDS30   **DISSERTATION PHASE-I**

M.TECH- IV Semester CSE (DS)   **L   T   P   C**

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20BDS31   **DISSERTATION PHASE-II**