MVJCE CURRICULUM

FOR

Bachelor of Engineering in Computer Science and Engineering

(Data Science)

(Scheme 2020)

III - IV Semester Syllabus

INSTITUTION VISION

To become an Institution of Academic excellence with International standards.

INSTITUTION MISSION

The Vision will be realized by

- Impart quality education along with Industrial exposure.
- Provide world class facilities to undertake research activities relevant to Industrial and professional needs.
- Promote entrepreneurship and value added education that is socially relevant with economic benefits.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

Our Vision:

To be recognized as a department of repute in the area of Computer Science and Engineering (Data Science), by adopting a top-notch teaching-learning process and imparting knowledge to equip students with the capabilities that are required for professional, industrial, and research areas, so that they can serve society.

Our Mission:

1. **Foster Innovation and Technical Competence:** To impart quality education in Computer Science and Engineering(Data Science), by

adopting modern teaching-learning processes, using innovation techniques that enable students to become technically competent.

2. **Create Competitive Software Professionals:** To provide training programs that bridge the gap between industry and academia, to produce competitive software professionals.
3. **Promote Personal and Professional Growth:** To create a scholarly environment that enables value addition to staff and students so that they can achieve personal and professional growth.

Program Outcomes (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEO)

13. IT Proficiency: Our Graduates will excel as IT experts, with extensive knowledge to analyze and design solutions to Data Science problems.
14. Social and moral principles: Our Graduates will work comfortably in a team, display professionalism and ethical values, familiarize themselves with current trends, and become responsible Engineers.
15. Higher education: Our Graduates will be confident of pursuing higher studies, armed with a sound knowledge of fundamental concepts and skills in basic sciences and IT disciplines.

Program Specific Outcomes (PSO)

1. PSO1.Software Expertise: Our Graduates will have the ability to understand, analyze and develop computer programs in areas related to algorithms, machine learning, python, data science, web design, DBMS, and networking, for efficient design of computer-based systems of varying complexities.
2. PSO2.Core Competence: Our Graduates will possess the ability to compete in the real-world, to provide solutions for real-world problems, with a broad range of programming languages and open-source platforms in various computing domains.

Program Outcomes:

- Engineering knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals and an Engineering specialization, to solving complex engineering problems.
- Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems, reaching substantiated conclusions using the first principles of Mathematics, Natural sciences, and Engineering sciences.
- Design/ Development of solutions: Design solutions for complex engineering problems, and design system components or processes that meet specified needs,with appropriate consideration for public health and safety, along with cultural, societal, and environmental considerations.
- Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information thus garnered, to provide valid conclusions.

- Modern tool usage: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.
- The Engineer and society: Apply to reason informed by contextual knowledge, to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
  4
- Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for, sustainable development.
- Ethics: Apply ethical principles, and commit to professional ethics and responsibilities conforming to the norms of engineering practice.
- Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams.
- Communication: Communicate effectively with the engineering community and with the society at large, on complex engineering activities, such as being able to comprehend and write effective reports or design documentation, make effective presentations, and give and receive clear instructions.
- Project management and finance: Demonstrate knowledge and understanding of Engineering and Management principles and apply these to one's own work, as a member or leader in a team, to manage projects, in multidisciplinary environments.
- Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent life-long learning, in the broadest context of technological changes.

MVJ COLLEGE OF ENGINEERING, BENGALURU

(An Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi, Approved by AICTE, Recognised by UGC under 2(f) and 12(B), Accredited by NBA & NAAC)

RULES AND REGULATIONS GOVERNING THE DEGREE OF BACHELOR OF ENGINEERING (B.E.)

(Registration, Attendance, Examinations, Evaluation and Award of Grades)

Effective from the academic year 2020 –21

MVJ COLLEGE OF ENGINEERING, BENGALURU
(An Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi, Approved by AICTE, Recognised by UGC under 2(f) and 12(B), Accredited by NBA & NAAC)

Index of Scheme and Syllabus for

Bachelor of Engineering in Computer Science and Engineering (Data Science)

(Scheme 2020)

III – IV Semester

1			**Short title and Commencement:** These Rules and Regulationsmay be called as "**MVJCE Rules and Regulations" Governing B.E. Programmes** for Implementation of academic autonomy. It will be in effect from the date of notification from UGC and VTU.
2			**Definitions of Key Words** The following are the definitions/descriptions that have been followed for the different terms used in the Regulations of B.E. Programmes: **a. Affiliating University:** Visvesvaraya Technological University (VTU), Belagavi. **b. Academic Autonomy:** means freedom granted by the Affiliating University to the college in all aspects conducting of its academic programmes for promoting academic excellence. **c. Autonomous College:** means a college notified as an autonomous college by the affiliating University as per its statutes i.e. VTU statutes on Autonomous Colleges (Amended) 2015 and further amended from time to time as per UGC regulations and guidelines. **d. Statutes:** means VTU statutes on Autonomous Colleges (Amended) 2015 and further amended from time to time. **e. Commission:**means University Grants Commission (UGC). **f. Council:**means All India Council for Technical Education (AICTE). **g. Course Instructor:** Teaching staff of the college appointed based on the norms laid down by the Affiliating University/Council. **h. Proctor:** Faculty member of the college appointed as per the norms. **i. Programme:**refers toain a particular stream/ branch of Engineering/branch of specialization leading to award of Degree. It comprises events/activities, comprising of lectures/ tutorials/ laboratory work/field work, outreach activities/ project work/ vocational training/viva/seminars/Internship/ assignments/presentations/self-study etc., or a combination of some of these. **j. Branch:** Means Specialization or discipline of B.E. Degree Programme, such as Civil Engineering, Mechanical Engineering, etc. **k. Academic Year:** Means two main consecutive semesters (odd followed by an even) and a Supplementary (Summer) semester constitute one academic year. **l. Semester:** The B.E. Degree Programme is of four academic years comprising of eight Semesters in case of students admitted to I year/ I semester of the B.E. programme and three academic years comprising of six Semesters in case of students admitted to II year/ III semester of the B.E.programme (Admission through Lateral entry scheme), with the year being divided into two main Semesters, Odd and Even of 19 to 20 weeks (with

working days greater than or equal to 90) and a Supplementary (Summer) semester of 8 weeks. The odd semester may be scheduled from August, whereas even semestermay be scheduled from January and Supplementary (Summer) semester starting from May/June of the year.

m. **Course:** Usually referred as 'paper' or 'subject' and is a component of a programme. All courses need not carry the same weightage. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/project work/ vocational training/viva/seminars/term papers/assignments/ presentations/ self-study etc., or a combination of some of these.

n. **Credit:** Refers to a unit by which the course work is measured. It also determines the number of hours of instructions required per week.

o. **Audit Courses (Non-Credit Course)/Mandatory Courses:** Means Knowledge/ Skill enhancing courses without the benefit of a grade or credit for a course.

p. **Choice Based Credit System (CBCS):** Refers to customizing the course work for a student, through the prescribed courses (i.e., Core, Elective and soft skill courses).

q. **Course Registration:** Refers to formal registration for the courses in each Semester (Credits) by every student under the supervision of a Proctor (also called as Faculty Advisor, Mentor, Counselor etc.,) at the Institution.

r. **Course Evaluation:** Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE) to constitute the major evaluation components prescribed for each Course, with only those students satisfying a minimum standard in CIE are being permitted to appear in SEE of the Course. CIE and SEE to carry equal weightage of 50:50 respectively, to enable each Course to be evaluated for 100 marks, irrespective of its Credits.

s. **Continuous Internal Evaluation (CIE):** Refers to evaluation of student's achievement in the learning process. CIE shall be conducted by the Course Instructor and include mid-term/weekly/fortnightly class tests, homework, problem solving, group discussion, quiz, mini-project, activities & seminar throughout the Semester, with weightage for the different components being fixed. CIE through tests called the 'Internal Assessment Tests'.

t. **Semester end examinations (SEE):** Refers to examination conducted at the college level at par with University level examination covering the entire Course Syllabus.

u. **Credit Based System (CBS):** Refers to quantification of course work, after a student completes teaching – learning process, followed by qualifying in both CIE and SEE. Under the CBS, the requirement for awarding a degree is prescribed in terms of total number of credits to be earned by the students.

v. **Credit Representation:** Refers to Credit Values for different academic activities considered, as per the Table.2. Credits for seminar, project phases, project viva–voce and internship shall be as specified in the Scheme of Teaching and Examination.

Table 2: Credit Values

Theory/Lectures (L) (hours/week/Semester)	Tutorials (T) (hours/week/Semester)	Laboratory/Practical (P) (hours/week/Semester)	Credits Sharing (L: T: P)	Total Credits
4	0	0	4:0:0	4
3	0	0	3:0:0	3
2	2	0	2:1:0	3
2	0	2	2:0:1	3
2	2	2	2:1:1	4
0	0	6	0:0:3	3
NOTE: Activities like, practical training, study tour and participation in Guest lecture shall not to carry Credits.				

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

x. **Grading:** Is done using Letter Grades such as: S(Outstanding), A(Excellent), B(Very Good), C(Good), D(Above Average), E(Average) and F(Fail), as qualitative measure of achievement in each Course, based on the percentage of marks secured in (CIE plus SEE) of the Course and conversion to Grade effected usingAbsolute Grading.

y. **Grade Point (GP):** Refers to a numerical weightage allotted to each letter grade on a 10-point scale as under

Letter Grade and corresponding Grade Points on a typical 10 – Point scale							
Letter Grade	S	A	B	C	D	E	F
Grade Point	10	09	08	07	06	04	00

z. **Passing Standards:** Refers to passing a Course only when getting GP greater than or equal to 04

aa. **Credit Point:** Is the product of grade point (GP) and number of credits for a course i.e.,

$$\text{Credit points (CrP)} = \text{GP} \times \text{Credits for the course}.$$

bb. **Semester Grade Point Average(SGPA):** Refers to a measure of academic performance of student/s in a semester. It is the ratio of total credit points secured by a student in various courses of a semester and the total course credits taken during that semester.

cc. **Cumulative Grade Point Average(CGPA)**: Is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points earned by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.

dd. **Transcript or Grade Card:** Refers to a certificate showing the grades earned by a student. A grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the programme details (Course code, title, number of credits, grades secured) along with SGPA of that semester and CGPA earned till that semester.

3 **Preamble**

MVJ College of Engineering (MVJCE), Bengaluru is an autonomous institute affiliated to Visvesvaraya Technological University, Belagavi and is one of the reputed institutes in the state of Karnatakaand rated as one among the top institutes in the state by various rating agencies. Academic autonomy has provided a great opportunity for the institute to design/frame the curriculum that meets the global requirements, adopting teaching-learning process that brings out innovation, creativity latent,enhances rational, logical and objective thinking ability of students.

The main advantage of academic autonomy is continuous learning and evaluation. Academic autonomy facilitates a shift over from examination centric to student learning centric. To bring this into reality is through understanding rules and regulations governing the academic programmes.

Academic autonomy aids to emerge as a leading technological institute in the country with gain in confidence, gratitude and respect of all its stake holders especially students, alumni, parents and the society at large.

4 **Program Duration and Total Credits**

The duration of various programmes and Number of Credits to be earned for award of degree is given in the Table 4.1.

Table 4.1: Programme Details

Sl. No.	Programmes	Duration	Total No. of Credits for the award of Degree	Maximum duration for obtaining degree
1.	B.E.	4 Years (Eightsemesters)	175	8 Years
2.	B.E. (Lateral Entry)	3 Years (six semesters)	135	6 Years

a) Students admitted to 1st year B.E. programme

i. Students admitted to 1st year B.E. shall complete the programme within a period of eight academic years from the date of first admission, failing which student has to discontinue the Course.

ii. Student who has not obtained eligibility to 3rd semester even after three academic years

			from the date of admission to 1st semester shall discontinue the programme or get readmitted to 1st year of the programme iii. Student who gets admitted to 3rd semester in three or less than three years shall complete the programme with or without break within eight academic years from the date of admission to 1st year, failing to which shall discontinue the programme or seek fresh admission following the prevailing admission procedure at that time. **b) Students admitted II Year B.E. under lateral entry** i. Students admitted II Year B.E. under lateral entry scheme shall complete the Programme within a period of six academic years from the date of first admission, failing which student has to discontinue the programme. ii. A student who has not obtained the eligibility to 5thsemester even after two academic years from the date of admission shall discontinue the Programme or get readmitted to 3rdsemester of the programme iii. Student who gets admitted to 5th semester in two or less than two years shall complete the programme with or without break within six academic years from the date of admission to 1st year, failing to which shall discontinue the programme or seek fresh admission following the prevailing admission procedure at that time.
5			**Eligibility for Admission (As per the Government/University orders issued from time to time)**
	5.1		**For Regular students** i. Admission to I year/ I semester Bachelor Degree in Engineering/ shall be open to the students who have passed the II PUC/ XII Standard/ Equivalent Examination with English as one of the Languages and obtained a Minimum of 45% of Marks in aggregate in Physics and Mathematics along with Chemistry / Bio-Technology / Biology / Electronics / Computer Science. ii. In case of SC/ST, Category -1 and OBC (2A, 2B, 3A and 3B) category students from Karnataka (Karnataka candidates only) the minimum marks for eligibility shall be 40 %. iii. With regard to the qualification earned from foreign countries, Equivalence certificate from the Association of Indian Universities and Eligibility Certificate from Affiliating University is Mandatory for admission to B.E. programme. In case of any dispute about the equivalence in qualification earned from foreign countries, the decision of the Affiliating University's Equivalence committee shall be the final in establishing the eligibility of the student.
	5.2		**For Lateral Entry students** i. Admission to II year/ III semester Bachelor Degree in Engineering/ Technology (Lateral Entry) shall be open to the Diploma holders and B.Sc. graduates.

			ii. Must have passed Diploma or equivalent examination as recognized by University and secured not less than forty-five percentage (45%) marks in the final year examination (fifth and sixth semesters) in the appropriate branch of engineering. In case of SC/ST and OBC students from Karnataka the minimum marks for eligibility shall be forty percent (40%). iii. Those candidates who have completed Diploma from other than Karnataka state shall provide the Equivalence/ Eligibility Certificate from the Director of Technical Education, Karnataka. **B.Sc. Graduates** i. Must have passed B.Sc. degree from a recognized University under the UGC or equivalent qualification as recognized by University and secured not less than forty-five percentage (45%) marks in aggregate (considering the marks of all six semesters). In case of SC/ST and OBC students from Karnataka (Karnataka candidates) the minimum marks for eligibility shall be forty percent (40%). Candidates must have studied Mathematics as subject of study at XII Standard. ii. Those students, who have passed a qualifying examination other than the PUC II examination of the Pre-University Education Board of Karnataka, have to obtain eligibility certificate for seeking admission to B.E. Degree Programme from Visvesvaraya Technological University, Belagavi.
6			**Academic Administration** Academic administration is monitored by the following academic committees / officers of the institute: - Governing Council (GC) - Academic Council (AC) - Institute Academic Affairs Committee (IAAC) - Departmental Academic Affairs Committee (DAAC) - Joint Board of Studies (JBoS) - Board of Studies (BoS) - Board of Examiners (BoE) - Programme Accreditation Committee (PAC) - Malpractice Enquiry Committee (MEC) - Grievance Redressal Cell (GRC) - Internal Quality Assurance Cell (IQAC) - Disciplinary Committee (DC) - Student Counseling Cell (SCC) - Departmental Project Evaluation Committee (DPEC)

			- Departmental Seminar Evaluation Committee (DSEC) - Interdisciplinary Project Evaluation Committee (IPEC) - Controller of Examination (CoE) - Dean of Academic Affairs (DAA) - Dean Student Welfare (DSW)
	6.1		**Governing Council (GC):** Responsible for overall general and academic administration of the Institute.
	6.2		**Academic Council (AC):** Responsible for overall academic regulations, curricula, scheme of syllabi, evaluation and approval of results.
	6.3		**Institute Academic Affairs Committee (IAAC):** Responsible for implementation of all academic decisions of AC and monitoring the registration of students, formulation of guidelines for conduct of examination and evaluation and all the issues connected to the academic activity. Responsible for award of 'I' Grade and approving the course to be studied by students having shortage of credits for all award of degree. <u>Structure of IAAC</u> Chairman : Principal Members : Chairmen of all Boards of Studies : Vice-Principal : Controller of Examination : Registrar : Two senior faculty members appointed by Principal Member Secretary : Dean (Academic)
	6.4		**Departmental Academic Affairs Committee (DAAC):** Helps Dean of Academic Affairs and Heads of the Departments in the registration of all departmental courses and preparation of academic timetable. Responsible for constitution of Departmental Project Evaluation Committee (DPEC) for project evaluation and Departmental Seminar Evaluation Committee

			(DSEC) for the evaluation of student seminars and Industrial training/field training. Responsible for identification of courses to be offered during evening / summer semester, allotment of guides for mini and major projects and recommending a course to be studied by students having shortage of credits for award of degree. Approval of registration to different soft core course of failed students. Structure of DAAC Chairman : Head of the Department Members : Three senior faculty members appointed by Head of the Department Convener: Faculty member appointed by Head of the Department
	6.5		**Joint Board of Studies (JBoS):** Responsible for discussing common academic issues and recommend to academic issues and recommend to academic council for approval. Structure of JBoS Chairman : Principal Members : Chairmen of all Boards of Studies Invitees : Controller of Examination & Training & Placement Officer Member Secretary : Dean (Academic)
	6.6		**Board of Studies (BoS):** Structure of BoS Chairman : Head of the Department Members : All members of DAAC Convener : Convener DAAC • Two experts from outside the Institute • One expert from outside the Institute nominated by the Vice-Chancellor from a panel of six recommended by Principal. • One representative from industry/corporate sector/allied area relating to placement to be nominated by the AC. • One post graduate meritorious alumnus to be nominated by Principal as member • Chairman co-opts the following members. Co-opted: Experts from outside the Institute whenever special courses of studies are to be formulated. • Other members of the faculty of the same Department. **The term of nominated members shall be three years.** The functions of BoS are to: • Prepare the syllabi for various courses keeping in view the objectives of the institute, interest of the stakeholders and State / National/International and societal requirements

			for the consideration and approval of academic council. • Suggest Head of Department for improving teaching and evaluation techniques • Prepare panel of experts for appointment as examiners • Guide the department with respect to teaching, extension and other academic activities in the departments • Perform any other function assigned by the AC
	6.7		**Board of Examiners (BoE)** <u>Structure of BoE</u> Chairman : Head of the Department Members : Two or three faculty members covering different areas of specialization, recommended by HoDOne /Two experts from other institutions. Convener: Faculty member appointed by Head of the Department The functions of BoE are to: • Scrutinize the question papers • Forward the panel of examiners for each course to the Controller of Examination • Prepare and approve the detailed scheme of evaluation pertaining to practical courses • Analyze the semester end examination results of all the semesters.
	6.8		**Programme Accreditation Committee (PAC):** Responsible for measuring the attainment of Cos (Course Outcomes), and Pos (Programme Outcomes) of each of the programme offered in the department and presenting the report to IAAC, PAC is constituted separately for each programme. <u>Structure of PAC</u> Chairman : Head of the Department Members : Two Associate Professors Two or Three Assistant Professors Convener : Faculty member appointed by Head of the Department

	6.9		**Malpractice Enquiry Committee (MEC):** To conduct enquiry of the students involved in malpractice and decide the nature of punishment to be awarded depending upon the gravity of the offence. <u>Structure of MEC</u> Chairman : Principal Members : Dean (Academic) : Vice-Principal : Registrar : Respective Head of Department/s : Legal advisor Member Secretary : Controller of Examinations
	6.10		**Grievance Redressal Cell (GRC):** Receives written complaints from thestakeholders regarding any kind of academic grievances. Examines the genuineness of the complaint and suggest remedies. Forward the recommendations to the chairperson of AC for implementation. <u>Structure of AGC</u> Chairman : Dean (Academic) Members : Vice-Principal : Registrar : Two or Three Senior faculty members appointed by Principal Member Secretary : Dean of Student Welfare

	6.11		**Internal Quality Assurance Cell (IQAC):** - Development and application of quality benchmarks. - Parameters for various academic and administrative activities of the institution. - Facilitating the creation of a learner-centric environment conducive to quality education and faculty maturation to adopt the required knowledge and technology for participatory teaching and learning process. - Collection and analysis of feedback from all stakeholders on quality-related institutional processes. - Dissemination of information on various quality parameters to all stakeholders. - Organizing inter and intra institutional workshops, seminars on quality related themes and promotion of quality circles. - Documentation of the various programmes/activities leading to quality improvement. - Acting as a nodal agency of the Institution for coordinating quality-related activities, including adoption and dissemination of best practices. - Development and maintenance of institutional database through MIS for the purpose of maintaining / enhancing the institutional quality. - Periodical conduct of Academic and Administrative Audit and its follow-up. - Preparation and submission of the Annual Quality Assurance Report (AQAR) as per guidelines and parameters of NAAC/NBA. <u>Structure of IQAC</u> Chairman : Principal Members : Dean (Academic) : Three Senior faculty members appointed by Principal : One member from Management : Few Senior administrative officers : One/ Two Nominees from local Society, Students and Alumni : One/ Two Nominees from Employers /Industrialists/Stakeholders : Registrar Member Secretary :Vice-Principal
	6.12		**Disciplinary Committee (DC):** Conduct enquiry pertaining to indiscipline and award suitable punishment. <u>Structure of DC</u> Chairman : Principal Members : Head of Department/s : Vice-Principal : Registrar

			: Dean of Student Welfare Invitees: Controller of Examinations Member Secretary: Dean (Academic)
	6.13		**Student Counselling Cell (SCC**): "Adolescence is a period when individual is over whelmed by a number of simultaneous developments, to meet this situation proper guidance is needed in this period. The teacher and institute encourage the development of effective maturity by providing the counselling and guidance". Whereas i feel dropping and withdrawal be advised by course co-ordinators.
	6.14		**Departmental Project Evaluation Committee (DPEC):** **Structure of DPEC** Chairman : Head of the Department Members : Two faculty members and guide Convener: Faculty member nominated by Head of the Department The functions of DPEC are to: • Evaluate project • Furnish the details of evaluation to concerned HoD
	6.15		**Departmental Seminar Evaluation Committee (DSEC):** **Structure of DPEC** Chairman : Head of the Department Members: Two faculty members and guide Convener : Faculty member nominated by Head of the Department The functions of DSEC are to: • Evaluate Technical seminar • Furnish the details of evaluation to concerned HoD
	6.16		**Interdisciplinary Project Evaluation Committee (IPEC):** **Structure of IPEC** Chairman : Nominated by IAAC Members : Two faculty members from each department Minimum six faculty nominated by Chairman Convener : Faculty member nominated by the Chairman The functions of IPEC are to: • Evaluate interdisciplinary projects • Furnish the details of evaluation to concerned HoDs
	6.17		**The following officials are also involved in academic administration.**

Controller of Examination (CoE): Responsible for preparation of examination manual, all matters pertaining to smooth conduct of examinations, evaluation and grading, publication of results and printing of grade cards, provisional degree certificates and transcripts. Responsible for maintaining all records pertaining to examinations.

Dean of Academic Affairs (DAA): Responsible for receiving, processing and maintaining all records pertaining to undergraduate program and post graduate programs including curricula, courses offered, academic calendar, records of drop, withdraw, rejection of results and long leave of students. Preparation of first year, OE/HS timetable

Dean of Student Welfare (DSW): Attend to all student related problems and disciplinary matters.

7 Academic Year

The breakup of academic year for regular semesters and supplementary (Summer) semester are given in the Tables 7.1 and 7.2. Details of vacation are given in Table 7.3.

Table 7.1: Break-up of academic year for regular semesters

Sl. No.	Action Plan	Odd Semester	Vacation between Odd and Even semesters	Even Semester	Vacation between Odd and Even semesters
1	Registration of courses	2 days (before the commencement of the semester)		2 days (before the commencement of the semester)	
2	Course Work	16 weeks		16 weeks	
3	Examination preparation holidays	1 week		1 week	
4	Semester End Examination	2 to 3 weeks		2 to 3 weeks	
Total		**19 to 20 weeks**	**1 to 2 weeks**	**19 to 20 weeks**	**10 weeks**

Table 7.2: Break-up of summer semester

Sl.No.	Action Plan	Summer Semester
1	Registration of courses	1 day (The next working day after the announcement of even semester examination results)
2	Course Work	7 weeks

3	Examination preparation holidays	1 weeks
4	Semester End Examination	1 weeks
5	Vacation	1 weeks
	Total	**10 weeks**

Table 7.3: Details of vacations

Between odd and even semester	2 weeks
Between even and odd semester (which includes one week vacation between summer & odd semester	10 weeks
Total	**12 weeks**

8

General Structure of Credit Allocation

Every course offered carries credits which are specified in the scheme of the study.

Credits allocation : 1 credit for 1 Lecture hour

1 credit for 2 Tutorial hours

1 credit for 2 Lab hours

For example : Engg. Maths-I carries 4.5 credits (4 lecture hrs. + 1 Tutorial hr.)

Engg. Physics carries 4 credits (4 lecture hrs.)

Physics Lab carries 1.5 credits (3 lab hrs.)

All courses carry a maximum of 100 marks.

A typical structure of the courses and credit allocation for Hard-core, Soft-core and Mandatory course (for undergraduate engineering programme) is given in Table 8.1.

Table 8.1: Categories of courses

Sl. No.	Course/Course Area	Type of Course	Credit Allocation
1.	Basic Sciences	Hardcore[1]	24
2.	Engineering Sciences	Hardcore[1]	20
3.	Professional Core courses	Hardcore[1]	75
4.	Professional Elective courses	Soft core[2]	18
5.	Open Electives	Soft core[2]	9
6.	Humanities & Social Sciences	Soft core[2]	8
7.	Project work, Seminar and others	Soft core[2]	21
8.	Soft Skills, Environmental Engineering on any other course offered by the respective departments for zero credits	Mandatory[3/4]	--

[1] If a student gets **'F'** grade in a hard-core course, he/she should repeat that course in its entirety. ***Further, if a student gets 'F' grade in credit course consecutively five times, he/she has to leave the Engineering program. However, this student can take re-admission to the 1st semester afresh.***

[2] If a student fails in a soft-core course he/she can re-register for same course or different course in the same soft-core group with the permission of DAAC and approved by IAAC

[3] **Students have to pass the mandatory courses for the award of the degree.**

[4] Any additional course/s taken by the student over and above the stipulated will not earn any credit.

9			**Registration** Students should register, for the courses as per the scheme of study, in each of the semester/s (odd / even) with the respective proctors. The dates for registration are specified in academic calendar of the Institute published before the commencement of academic year. Registration by the students should be completed within the dates specified in the academic calendar. **Registration after the last date is not permitted. Students should be present in person to obtain the approval (Form-1) from the proctor for registered courses.**
	9.1		**Registration procedure** i. On the day of registration, the students have to approach the concerned proctor. ii. Proctor will counsel the students and will advise the students regarding the courses to be registered during the current semester taking into account the performance of the student during the previous semester/s. iii. Students have to register through online mode using their credentials. iv. A print copy of the filled registration form **(Form-1)** shall be submitted to the Proctor along with fee paid receipt. v. The proctor will enroll the students for the courses as indicated in the registration form.
	9.2		**Eligibility requirements for Registration to an academic year** i. He/she should not have obtained 'F' grades in credit courses five times consecutively. ii. For the registration to odd semester, *the total number of courses Withdrawn (W), Dropped (DP), Not Eligible (NE), Failed (F), Incomplete grade (I) and X grade should not exceed 4.* iii. CGPA should be ≥ 5 at end of academic year. iv. Dues of the previous semester to the Institution, Hostel and Library are to be paid. v. Should not have any disciplinary proceeding pending against the candidate. **Illustrations:** a) A candidate seeking eligibility to 3rd semester should not have W, DP, NE, F, I or X grade in more than four courses of first, second and supplementary semesters taken together excluding mandatory courses. b) A candidate seeking eligibility to 5th semester should not have W, DP, NE, F, I or X grade in more than four courses of 1st to 4th semesters and supplementary semester put together excluding mandatory courses. c) A candidate seeking eligibility to 7th semester should have passed in all the courses of 1st and 2nd semesters and should not have W, DP, NE, F, I or X grade in more than four courses of 3rd to 6th semesters and supplementary semester put together excluding mandatory courses.

			i. Dues of the previous semesters to the Institution, Hostel and Library are paid. ii. Should not have any disciplinary proceeding pending against the candidate.
	9.3		**Registration for odd semester** i. For registration to III, V and VII semesters, students should satisfy eligibility criteria as per the clause 9.2. ii. A student has to register for all the courses offered in the semester. iii. A student has to register for a minimum of 16 and a maximum of 28 credits including re-registered courses, if any.
	9.4		**Registration for even semester** i. All students are eligible to move from odd semester to even semester during the same academic year. ii. A student has to register for all the courses offered in a semester. **iii.** A student has to register for a minimum of 16 and a maximum of 28 credits including re-registered courses, if any.
	9.5		**Registration of courses for 'DP','W', 'NE' and 'F' grades** i. Students who have dropped, withdrawn, secured NE / F grade in courses of any semester should repeat those courses in their entirety to secure E or higher grades by re-registering in supplementary (Summer) semester or as and when offered in the regular semesters. ii. If a student has dropped, withdrawn, secured NE / F grade in a Professional Electives / OE / HS course, then student may re-register for the same or different course. **iii.** If a student gets F grade in project / seminar, he/she has to take up new project / seminar topic.

	9.6		**Registration for supplementary (Summer) semester** i. Supplementary semester is of eight weeks' duration and is offered at the end of even semester. ii. Supplementary semester is for students who have failed with F grade during regular semesters, dropped, withdrawn, secured NE grade in the courses. iii. The list of courses offered during the supplementary semester will be announced at the end of even semester. iv. Registration by the students should be completed on or before the registration dates specified in the academic calendar. v. Registration after the last date is not permitted. vi. A student is allowed to register for a maximum of four theory courses during the supplementary semester excluding one mandatory course provided that there is no overlap of timings even for one hour. vii. Dropping and withdrawal of courses are not allowed in supplementary semester. a) Compensatory Test will not be conducted in supplementary semester. b) X and I grades are not awarded in supplementary semester.
	9.7		**Course prerequisites** Certain courses need the knowledge of courses offered in the previous semesters, called prerequisites. Each department notifies the courses, which need prerequisites and the candidate shall register for such courses(s) only after he/she completes the prerequisites by securing at least E grade. Students are not permitted to register for the courses having prerequisites in the higher semester, if they had dropped or withdrawn the prerequisite courses in the previous semesters.
	9.8		**Registration for Elective courses (Professional and Open Electives)** i. List of elective courses offered will be published by the respective department ii. Student shall exercise his/her option in respect of elective course/s and register for the same offered by the department at the beginning of respective semester iii. Elective/s can be offered if the minimum number of students registered shall not be less than ten iv. However, the condition as stated in clause 9.8 (ii) shall not be applicable to the programme having class strength is less than 10. In such cases only one elective shall be offered v. The maximum number of registration to an elective may be restricted by the concerned department **vi.** Student may be permitted to opt for change of elective course/s within fifteen days from

			the date of commencement of the semester.
	9.9		**Range of minimum and maximum credits to be earned in an academic year (inclusive of supplementary semester)**
			i. I year ≥ 28 to ≤ 40 ii. II and III year ≥ 32 to ≤ 56
	9.10		**Range of minimum and maximum credits to be registered per semester**
			In each semester students have to register for a minimum of 16 and a maximum of 28 credits including re-registered courses, if any.
	9.11		**Lateral entry** i. Diploma Holders: Students admitted to Bachelor of Engineering at the III semester level have to register for mandatory non-credit courses "Additional Mathematics-1" in III semester and "Additional Mathematics-2" in IV semester respectively for award of degree. These students are exempted from studying a professional Core Course which they have already studied in their Diploma level. Also they have to study Communicative English as Non-credit Mandatory Course. **ii.** B.Sc. Degree holders: Students admitted to Bachelor of Engineering at the III semester level have to register for mandatory non-credit courses "Engineering Graphics and Elements of Civil Engineering and Mechanics for award of degree.
10			**Attendance Requirement** i. A candidate has to obtain a minimum attendance of 85% in each course to appear for the Semester End Examination (SEE). However, such of the students who have attendance between 75% and less than 85% may get condonation of attendance by Academic Council only on valid grounds such as hospitalization, participation in university and intercollegiate sports, cultural activities and participation in seminar, workshop and paper presentation with prior permission. Students must submit the request for condonation of attendance in the prescribed format with supporting documents and duly recommended by the Head of the Department at least one week before the commencement of examination, failing which condonation of attendance will not be considered. ii. Students having less than 75% are not eligible for condonation of attendance on any ground. iii. If a candidate fails to satisfy the minimum attendance requirements in any course, NE grade is awarded to that course. **iv. The basis for the calculation of attendance shall be the period prescribed by the**

			institute in its calendar of events. For I semester B.E. & lateral entry students, the attendance is reckoned from their date of admission. For all other semesters, attendance will be counted from the date of commencement of class as announced in the institute academic calendar. **v.** It is mandatory on the part of the students to regularly check the status of their attendance with the respective faculty.
11			**Projects** Projects consist of mini project spread over V & VI semesters and Major project spread over VII & VIII semesters.
	11.1		**A. Mini Project** The aim is to bring out creativity and innovation in the students preferably in the form of a working model. This project can be taken up by a group of students (normally four members) from the same or different departments. If the project demands, more man power, then the number of students in the group can be relaxed by the Heads of the concerned departments. i. The project is spread over two semesters (V & VI) and evaluated at the end of each semester. ii. No credit is allocated during V semester. iii. Mini project is evaluated during the VI semester for 100 marks (50% CIE and 50% SEE) iv. DAAC assigns guides for mini projects. **v.** Interdisciplinary projects have a guide from each of the participating departments.
	11.2		**B. Major Project** i. It is spread over VII and VIII semesters and evaluated at the end of each semester for the assignment credits. ii. The project may be based on; • Design aspects • Theoretical/Analytical Modelling • Computer Simulation • Developing Working Model iii. The project could be part of the research activity carried out in the department. iv. The literature survey should be one of the components of the project. v. The project can be carried outside the institute in a recognized industry/research lab. vi. Head of the Department and DAAC assign guides for the major project. • The project can be taken up by a group of students (normally four members) from the same or different departments. • Interdisciplinary projects have a guide from each of the participating departments.

			• The students should maintain a project diary consisting of day-to-day work carried out by them with monitoring by the guide on weekly basis. vii. Project Report completed in all respects and approved by the guide and HoD must be submitted at least one week before the commencement of theory examination of VIII semester. Reports submitted after the last date will not be evaluated in the even semester and I grade will be awarded to major project. The students have to register during supplementary semester or subsequent semester. viii. Plagiarism check has been made mandatory. The project report shall be summarily rejected, if the plagiarized content (similarity index excluding self-written research papers, common definitions) is >25%. In such cases students have to resubmit the project report with prescribed fee within fortnight from the date of rejection. ix. Two chances shall be given for the resubmission. After two chances if the plagiarism level found unacceptable then, students have to repeat the project work entirely by reregistering during subsequent academic year.
12			**Seminars** Students of VII semester have to present a technical seminar on emerging area in the respective discipline.
13			**Field training/Industrial Internship** Students have to undergo this training for a period of 6 weeks (minimum) during the vacation between even and odd semesters of II and III year or III and IV year. Those students who are unable to complete during these periods will have to undergo the industrial training after the VIII semester and the VIII semester Grade Card will be issued only after the successful completion of industrial training by that student.
14			**Research Initiative at UG level** Students who have CGPA of 8.5 and above up to 4thsemester and would like to pursue research work during 5th& 6thsemesters are required to identify the area of research and the guide. The students have to submit the application to the concerned Head of the Department in the prescribed format (Form-6) available in the department. Students are exempted from studying one Open Elective and one Professional Elective course in 5thand 6thsemesters.
15			**Examination and Evaluation** Evaluation of a student in each course is a continuous process, which is based on: - Continuous Internal Evaluation (CIE): 50% of the marks allotted for the course. - Semester End Examination (SEE): 50% of the marks allotted for the course.
	15.1		**Pattern of question papers for theory courses**

		15.1.1	**Internal Assessment (IA)** i. There will be three mandatory tests. ii. Question paper for the IA consists two parts i.e. Part A and part B. Part A will be a compulsory question consists of objective type or short answer type questions of 1 or 2 marks each for a total of 6 marks covering the syllabus during the periods specified. iii. Part B also covers the syllabus during the periods specified consists of two questions of 12 marks each having choices and may contain sub-divisions. Students have to answer two full questions. iv. Duration of each test is 90 minutes
		15.1.2	**Semester End examination** i. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. ii. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. iii. One question must be set from each unit. iv. The duration of examination is 3 hours.
	15.2		**Examination and evaluation in theory courses**
		15.2.1	**Continuous Internal Evaluation (CIE)** CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: - Quizzes/mini tests (4 marks) - Mini Project / Case Studies (8 Marks) - Activities/Experimentations related to courses (8 Marks) - Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests a) First test is conducted at the end of sixth week from the beginning of the semester. The syllabus for this test is the syllabus covered in the first six weeks. The duration will be of 90 minutes. b) Second test is conducted at the end of tenth week. The syllabus for this examination is the syllabus covered between first test and second test. The duration will be of 90 minutes. c) Third test is conducted at the end of fifteenth week. The syllabus for this examination is the syllabus covered between second test and third test. The duration will be of 90 minutes.

d) A quiz is a mini test of about 20 minutes' duration. One quiz during the period up to first test, second quiz between first test and second test.

Details of marks distribution for evaluation of hard-core & soft core courses is shown in Table 15.2.1(a)

Table 15.2.1 (a)Marks distribution

Details		Marks
Average of three Internal Assessment (IA) Tests of 30 marks each i.e. ∑ (Marks obtained in each test)÷ 3	CIE (50)	30
Quizzes		2x 2 = 4
Activities/Experimentations related to courses		8
Mini Project / Case Studies		8
Semester End Examination	SEE (50)	50
	Total	**100**

e) It is mandatory for a student to appear for all three tests. If any student who is unable to attend any one or both tests **on account of hospitalization only he/she is permitted to attend the compensatory test. He/she should have maintained a minimum of 85% attendance in that particular subject till the date of compensatory test.** A request letter in the prescribed proforma **(Form-2)** has to be submitted by the student to the Head of the Department within one week from the end of respective test which will be forwarded to Dean (Academic). The syllabus for compensatory test includes the syllabus covered from the beginning of the semester up to compensatory test time. The duration of test will be of 90 minutes. The marks secured in the compensatory examination are considered for computation of CIE in place of any one of the three tests in which student was absent. If a student was absent for all three tests, the marks secured in compensatory examination is considered for the I-test and he/she is considered as absent for remaining tests.

i. Students who have missed quizzes, tests on account of, **participation in co-curricular activities, sports and cultural fests are permitted to take alternative quiz and test.** The original copy of the letter shall be approved by the Principal recommended by Physical Education Director/Cultural Committee Chairman has to be submitted to Dean, Academic Affairs. The faulty in-charge will conduct the quiz/test.

ii. Compensatory tests will be conducted during 16th week from 3.30 to 5.00 PM on normal working days or weekends.

iii. **Compensatory test is not for improvement of marks. Compensatory test will not be given to students involved in malpractice either during tests and / or quizzes.**

f) Minimum of two assignments are to be submitted, first between I and II test, second between II test and last working day of that semester.

g) For mandatory courses two tests are conducted and the sum of the two is taken as Continuous Internal Evaluation (CIE) marks. There will be only one compensatory test for 25 marks. Allotment of marks for Mandatory course is shown in Table 15.2.1 (b)

Table 15.2.1 (b) CIE & SEE marks allotment for mandatory courses

Details		**Marks**
First Test	CIE (50)	25
Second Test		25
Semester End Examination	SEE (50)	50
	Total	**100**

h) To maintain transparency, the students are provided access to the valued Test answer scripts, quiz papers and assignments. It is mandatory for the students to check the quiz/test answer papers after evaluation and affix their signature.

i) Head of the Department announces the CIE marks in the department notice board prior to the commencement of semester end examination. **Any discrepancy in CIE marks shall be brought to the notice of concerned faculty immediately by the students for redressal before the commencement of SEE.**

j) ***If** a student fails to obtain 40% (i.e., 20/50) of total marks allotted for CIE (Hardcore / Soft core courses) then, such a student is awarded NE grade and will not be permitted to take SEE. Such students have to repeat the course in its entirety by re-registering that course when it is offered.*

k) **Quizzes and Assignment: Questions for quizzes may be objective type, short answer type and numerical problems. Assignments shall be given on complex engineering problems and students have to use problem** solving skills.

		15.2.2	**Semester End Examination (SEE)** i. Semester End Examination is conducted as per the academic calendar of the Institution. The examination is conducted for 100 marks and is reduced to 50 marks for computation of grades. ii. A student has to obtain a minimum of 40% (i.e., 20/50 marks) of the marks allotted to SEE, failing which F or X grade will be awarded for that course. WhereasX grade is awarded to a student who has minimum attendance of 85% and minimum of 90% in CIE. iii. SEE answer scripts are evaluated by the internal examiners normally the Course Instructor appointed by the Controller of Examination and normally 20% of the scripts moderated by the external examiners appointed by the Controller of Examination in consultation with respective BoEs. iv. If the difference between the marks awarded by two evaluators is less than 10%, then the average of the marks awarded by the two evaluators is taken for further processing. v. If the difference between the marks awarded by two evaluators is more than 10%, then a third evaluator assesses the answer script. The average marks of the nearest two evaluations are taken for further processing. If one of the three evaluation marks falls exactly midway between the other two, then higher two evaluation marks are taken for averaging.
	15.3		**Evaluation of Practical courses**

15.3.1 Continuous Internal Evaluation (CIE)

i. CIE marks for the practical course is computed by adding the average of the marks secured by the student for conducting each of the experiment plus the marks secured in the test conducted and also the marks secured for the open ended experiments (experiments embedded with theory concepts of the course/s) at the end of the course.

ii. Head of the Department announces the CIE marks in the department notice board and submits a copy to Controller of Examination duly signed by the faculty in-charge at the end of the semester.

iii. If a student fails to obtain 50% (i.e., 25/50) of total marks allotted for CIE in Practical/Mini Project/Project/Internship then, such a student is awarded NE grade and will not be permitted to take SEE in the said course. Such students have to repeat the course in its entirety by re-registering that course when it is offered.

The breakup of CIE marks is given in the Table 15.3.1 9a) and (b)

Table 15.3.1 (a) Breakup of CIE marks for lab courses without Open Ended Experiments

Regular Lab Work and writing lab records	(20 + 15) 35 marks
Lab test and Viva-voce at the end of the semester	(10 + 5) 15 marks
Total	**50 marks**

Table 15.3.1 (b) Break up of CIE marks for lab courses with Open Ended Experiments

Regular Lab Work and writing lab records	(15 + 10) 25 marks
Lab test and Viva-voce at the end of the semester	(10 + 5) 15 marks
Evaluation of open ended experiment	10 marks
Total	**50 marks**

15.3.2 Semester End Examination (SEE)

Semester end practical examination is conducted jointly by one internal examiner and one external examiner. Break up of SEE marks is given in the Table 15.3.2

Table 15.3.2 Breakup of SEE marks for lab courses

Writing the procedure	10 marks
Conducting lab experiment(s)	20 marks
Analysis of experimental result & presentation	10 marks
Viva-voce related to the experiments	10 marks
Total	**50 marks**

For pass in practical course students has to secure minimum 40% of allotted marks (i.e.

20/50).

15.4 **Evaluation of Projects, Seminars, Industrial / Field training & Co-curricular activities**

15.4.1 ***CIE for Mini Project***

The CIE for mini project is spread over V and VI semesters. At the end of V semester student have to submit a report containing details of the work done. The breakup of marks of CIE for mini project is given in table 15.4.1

Table 15.4.1 Breakup of CIE marks for Mini Project

Evaluation at the end of V semester (DPEC)	15 marks
Evaluation at the end of VI semester (DPEC)	15 marks
Evaluation by Guide	20 marks
Total	**50 marks**

15.4.2 **SEE for Mini Project**

Mini project work will be jointly evaluated by one internal and one external examiner appointed by the Chairman BoE. The breakup of marks is shown in Table 15.4.2For pass in mini students has to secure minimum 40% of allotted marks (i.e. 20/50).

Table 15.4.2 Breakup of SEE marks for Mini Project

Project Report, Presentation, Demonstration and Quality of work	30 marks
Viva-Voce	20 marks
Total	50 marks

If a student fails to satisfy the prescribed CIE and SEE, has to be repeated in its entirety by reregistering for the same.

15.4.3 **CIE for Major Project**

At the end of VII semester, for major project, student has to give the seminar covering the

literature survey and preliminary requirements/specifications/flow chart/design steps pertaining to the chosen project. Also, the students in the project batch have to submit a report to the respective guide.

The breakup of marks for CIE for major project at the end of VII semester is given in Table 15.4.3

Table 15.4.3 CIE marks break up for major project (during VII semester)

Relevance of the topic	10 marks
Report	20 marks
Evaluation by Guide	25 marks
Presentation	30 marks
Viva-voce	15 marks
Total	**100 marks**

CIE for report shall be awarded only on submission of report covering the literature survey and problem definition. Two credits are assigned for the work done during VII semester. **However, there is no SEE for major project during VII semester.**

15.4.4 **CIE for major project during VIII semester**

Major project is evaluated for 100 marks (50% CIE & 50% for SEE) during VIII semester. The breakup of CIE marks is given in table 15.4.5

15.4.5 **Co-curricular Activities (Max of five marks)**

Weightage of 5 marks is given for co-curricular activities, with an objective of inculcating in students, the culture of preparing and presenting papers, encouraging them to apply the technical knowledge for solving real life problems and motivating them towards self-study.

- 2 marks for presenting paper in National / International conference by maximum of two authors.
- Additional 2 marks for every additional paper presentation but not in the same conference and the paper should not be same.
- 2 marks for participation in hobby project exhibition.
- Additional 2 marks for participation in hobby project exhibition held at different technical institutions or different project.
- 3 marks for obtaining any prize other than first prize.
- 4 marks for obtaining first prize.
- 5 marks for publication in journals.
- 3 marks for every certification obtained from reputed companies like IBM, Microsoft and other organizations approved by the department.
- Additional 3 marks for every additional certification.

- For paper presentation, a maximum of two authors (first two) is considered and if the paper is from the project work, all the students are considered.
- **Technical Quiz / Business Quiz / Auto Quiz**

  2 marks for qualifying in Written Test

  3 marks for obtaining any prize other than first prize

  4 marks for obtaining first prize
- **Hardware Debugging / Programming Contest**

  2 marks for qualifying in Written Test

  3 marks for obtaining any prize other than first prize

  4 marks for obtaining first prize
- **Robotics/Catia Design Contest/Cyber Eptymology/ Instantiania**

  2 marks for participation

  3 marks for obtaining any prize other than first prize

  4 marks for obtaining first prize
- This weightage is considered for computing CIE for the Project Work at VIII semester. The paper presentation and participation in hobby project exhibition & other activities mentioned above may be in any semester (I to VIII sem).

In View of the proposed weightage for co-curricular activities, following is the modification in the breakup of CIE for major Project.

Table 15.4.5 CIE marks break up for major project (during VIII semester)

Seminar on project and demonstration	20 marks
Report	10 marks
Evaluation by Guide	15 marks
Co-curricular Activities	05 marks
Total	**50 marks**

15.4.6 **SEE for the major project**

SEE is conducted by one external examiner and one internal examiner. The breakup of marks is given in Table 15.4.6. For pass in project work students has to secure minimum 40% of allotted marks (i.e. 20/50).

Table 15.4.6 Breakup of SEE marks for major project

Project Report, Presentation, Demonstration and Quality of work	30 marks
Viva-Voce	20 marks
Total	**50 marks**

If a student fails to satisfy the prescribed CIE and SEE, has to be repeated in its entirety by reregistering for the same.

15.5 **Evaluation of Seminars**

Students of VII semester have to present a technical seminar on emerging area in the respective discipline.Seminar is evaluated for 100 marks.The breakup of marks for the evaluation of seminar is given in Table 15.5. For pass students has to secure minimum 50% of allotted marks.

Table 15.5 Breakup of Seminar

Relevance of the topic	10 marks
Report	20 marks
Presentation	50 marks
Viva-voce	20 marks
Total	**100 marks**

Note: There is no CIE and SEE for seminar.

15.6 **Evaluation of Field training/Industrial Internship**

Evaluation of the Field training/Industrial Internship shall be conducted during VIII semester by internal and external examiners for 100 marks. The external examiner shall be from the Industry where the student carried out the Field training/Industrial Internship. In case of non-availability of external examiner, the concerned head of the department shall appoint an external examiner from the nearby college or a senior faculty member from outside the department in consultation with respective BOE and approved by Principal. The Field training/Industrial Internship carries two credits. A student has to get a minimum of 40% marks for a pass. If a student fails to complete the same, then the Field training/Industrial Internship has to be repeated in its entirety.For pass in internship students has to secure minimum 40% of allotted marks (i.e. 20/50).

The breakup of marks for the evaluation of training is as in Table 15.6

Table 15.6 Marks break up for field training evaluation

Evaluation by the supervisor under whom the training was carried out	25 marks
Evaluation by DSEC	
i. Relevance of the Field training/Industrial Internship	10 marks
ii. Report	25 marks
iii. Evaluation	40 marks
Total	**100 marks**

15.7 **Review of Answer Scripts**

Evaluated Answer Scripts are made available to the students for review in presence of parents by registering for the same within the dates prescribed in the academic calendar.

	15.8		**Extended (Revaluation)Evaluation** The students, who have not satisfied with the evaluation in SEE, can apply for Extended Evaluation on payment of prescribed fee within the stipulated time as notified by the institute. Extended Evaluation is carried out by external examiners independently (who have not evaluated the answer script earlier). The highest marks among earlier awarded marks and theawarded by the external examiners is considered as the final marks in SEE for award of grade.
	15.9		**Rejection of Results** i. A student may reject his/her results of all the courses registered in a semester of an academic year *if he/she is not satisfied with the result of any semester,* subject to the condition that the maximum duration for the completion of the course as mentioned in Table 4.1 is not exceeded. The rejection is permitted only once during the entire program of study ii. Student who desire to reject the SEE results of a semester shall reject the total performance in all courses of semester (including CIE marks) either rejecting or retaining the CIE marks. iii. Student who desire to reject the total SEE performance of an odd/even semester including CIE marks, have to repeat that semester of prevailing scheme by taking readmission during the subsequent academic year/s. However, student is governed by clause 4 iv. If the student rejects the SEE permanence of odd semester excluding CIE marks shall be permitted to register the courses of next immediate even semester. v. If the student rejects the SEE permanence of even semester excluding CIE marks shall not be permitted to register the courses of next immediate odd semester as per clause 19. In such cases student shall take admission to the next odd semester of prevailing scheme during the subsequent academic year/s after obtaining eligibility. However, student is governed by clause 4 vi. Application for Rejection of results shall be submitted in the prescribed format **(Form-5)** to respective Head of the department within a week from the date of announce of results. Same shall be approved by the Principal. vii. Rejection of the performance of VII semester project work is not permitted viii. **Students who opt for rejection of results shall not be eligible for award of ranks and Honours Degree**.
16			**Grade card**

- Grade card is issued normally within months' time from the date of announcement of the results.
- The total number of activity points earned will be indicated in the Grade Card
- CGPA is computed by considering the latest grade obtained by the student in the courses repeated.
- After graduation, a student can apply for a consolidated grade report by paying prescribed fee for to the Institute.
- There is a provision for the issue of actual marks card after the graduation on payment of prescribed fee to the institute.

For obtaining a duplicate grade report, the student has to lodge a complaint in the jurisdictional police station and obtain the FIR. An affidavit on a stamp paper duly signed by a Notary and FIR should be submitted to the principal.

16.1

Percentage equivalence of the Grade Points

Sometimes, it would be necessary to provide equivalence of the CGPA with the percentages and/or class awarded as in the conventional system of declaring the result of university examinations. Conversion formula for the Conversion of CGPA into Percentage on a 10-points Scale is Given as Percentage of Marks Secured, $P = [\text{CGPA Earned} - 0.75] \times 10$

Illustration for A CGPA of 8.25:

$$P = [\text{CGPA Earned } 8.25 - 0.75] \times 10 = 75\ \%$$

Table 16.1(a) Percentage equivalence of grade points 10-points Scale

Grade point	Percentage of marks
5.75	50
6.25	55
6.75	60
7.25	65
7.75	70
8.25	75

Table 16.1(b) Class Designation

Grade point range	Class
≥ 5 &< 6.75	Second
≥ 6.75 < 7.75	First
≥ 7.75	Distinction

16.2

Letter Grades

Awarding Letter Grades

i. A letter grade is basically a qualitative measure indicating the performance of a student in that course, such as Outstanding (S), Excellent (A), Very Good (B), Good (C), Average (D),

Poor (E) and unsatisfactory / Fail (F).

ii. Letter grades are awarded for each course based on the total marks obtained in CIE and SEE.

iii. Pass grades are awarded only when CIE≥ 40% and SEE ≥ 40%.

iv. The range of marks corresponding to letter grades is indicated in the Table 16.2. The grade point indicates the numerical value associated with each letter grade.

Table 16.2 Letter grades, grade points and corresponding marks range

Level	**Out-standing**	**Excellent**	**Very Good**	**Good**	**Average**	**Poor**	**Fail**
Letter grades	S	A	B	C	D	E	F
Grade points	10	9	8	7	6	4	0
Absolute Marks Range (%)	**≥ 90**	**80 to 89**	**70 to 79**	**60 to 69**	**50 to 59**	**40 to 49**	**< 40**

v. There are two other letter grades, Pass (PP) / Fail (NP) applicable for mandatory course. Grade PP is awarded only when SEE ≥ 40% (for 50 marks) and CIE + SEE ≥ 40% (for 100 marks), otherwise the grade NP is awarded.

16.3 **Transitional Letter Grades**

Transitional letter grades (I, X) are awarded in the following cases as per clause 16.3.1 and 16.3.2. I or X should be converted into one of the letter grades between S to E within that academic year.

16.3.1 **Incomplete Grade (I)**

A student who has missed SEE, due to valid reasons like his/her hospitalization/disaster in his/her family should immediately apply for the award of I grade in that course. Clash in SEE time table (permission from CoE has to be taken for clash in SEE time table). The IAAC subcommittee (Principal as Chairman, Deans and CoE, as members) will decide about awarding 'I' grade taking into consideration all the documentary evidences produced by the student. The student is permitted to appear for the SEE in that course, which is conducted in either even semester or in summer semester of that academic year. His/her CIE marks secured in the course earlier will be considered for the award of grade along with SEE marks.

If permission for 'I' grade is not accorded by IAAC subcommittee, then F grade is awarded for the course and the student has to re-register for the course in its entirety when it is offered.

'I' grade is not awarded for re-registered courses during Supplementary Semester Examination.

16.3.2 **X-Grade**

			If a student has a minimum attendance of 85% and a minimum 90% in CIE and has obtained < 40% marks in SEE, in regular even or odd semester, then, he/she will be awarded X grade. - Such a student is permitted to appear for SEE conducted during that academic year. - If such a student fails to obtain E grade or above in regular or summer semester, he/she will be awarded F grade. The student should re-register for the same course in its entirety whenever the course is offered. - If such a student fails to appear for SEE either in even semester or in summer semester of that academic year, X grade will be automatically converted into 'F'-grade. - However, a student who has been awarded X-grade also has the option of: i. Reregistering of such courses either during summer semester or whenever the courses are offered. ii. Audit the courses during summer semester of that academic year by paying prescribed fees. iii. **X-grade is not awarded during supplementary semester SEE.**
	16.4		**Dropping of the courses (DP)*** - Student, who wants to drop a theory course, has to apply in a prescribed format (Form-3) through concerned teacher, Proctor and Head of the Department to the Dean (Academic) for permission. - Students are not permitted to drop theory course that are integrated with laboratory course in that semester/any other semester. - Mandatory courses cannot be dropped. - The dropping of course is allowed within the date specified in the academic calendar of that semester, usually eight weeks from the commencement of the semester. A student is allowed to drop a maximum of two courses. If the student drops the course within specified date, the fee for the course dropped will be adjusted for subsequent registration of the same course. The course dropped will not be indicated in the grade card. - Dropping of laboratory course(s) is not allowed. - Any re-registered course cannot be dropped. *** A student can drop and or withdraw maximum of two courses.**

	16.5		**Withdrawal Grade (W)*** A student, who wants to withdraw a theory course, has to apply in the prescribed proforma**(Form-4)** through the faculty who teaches the course, Proctor and Head of the Department to the Dean (Academic) for the permission to withdraw. **A student is not allowed to withdrawn/drop same course more than once.** Withdrawal of practical course(s) is not allowed. - Students are not permitted to withdraw theory courses that are integrated with laboratory course wither in that semester or in any other semester. - Withdrawal of a course is allowed within the specified date in the academic calendar. A student is not permitted to withdraw any course after the specified date in the academic calendar. - If a student withdraws the course after eight weeks from the commencement of the semester and up to fourteenth week, the registration fee will be forfeited. - Students have to reregister the withdrawn course after paying the prescribed fees in the summer semester or in the subsequent semesters during which the course is offered. - Transitional grades like withdrawal, incomplete and X grade are not awarded during summer semester.
	16.6		**Not Eligible Grade (NE)** Grade NE is awarded to the students who fail to secure attendance at least 85% and CIE of 40%.
	16.7		**Make-up Examination:** The students who has been awarded with 'X' or 'I' gradesare eligible to attend make-up examinations as per the dates notified in Academic Calendar of the institution.
17			**Temporary Withdrawal** Student shall be permitted to withdraw temporarily on the grounds like, prolonged illness, grave calamity in the family or any other serious happening. The withdrawal hall be for periods which are integral multiples of a semester, provided that, i. Student applies to the college within at least 6 weeks of the commencement of semester or from the date student last attended the classes, whichever is later, stating the fully the reasons for such a withdrawal along with supporting documents endorsed by the parents/guardians ii. Such withdrawal shall be permitted only under the provisions of clause 4 iii. Student availing temporary withdrawal shall be required to pay tuition and other fee. iv. Student will be entitled to avail temporary withdrawal facility only once during the programme. Any concession for the student shall be approved the Academic Council of

the College

v. Student seeking temporary withdrawal facility shall not have any dues or demands at College/University including tuition and other fee. Once paid shall not be refunded

18 **Academic Performance Evaluation**

The academic performance of a student is indicated by two different indices, Semester Grade Point (SGPA) and Cumulative Grade Point Average (CGPA).

- SGPA is an indication of the performance of the student in the current semester. SGPA is calculated as below.

$$\textbf{SGPA} = \frac{\sum [(\text{Course credits}) \times (\text{grade points})] \text{ for all course that semester excluding transitional grades}}{\sum [(\text{Course credits}) \text{ for all course registered in that semester including F grades and excluding W and DP courses.}}$$

- CGPA is an indication of the cumulative performance of the student from the first semester up to the current semester.

$$\textbf{CGPA} = \frac{\sum [(\text{Course credits}) \times (\text{grade points})] \text{ for all course with letter grades are E and above from the I semester till the current semester}}{\sum [(\text{Course credits}) \text{ whose letter grades are E and above from the I semester till the current semester.}}$$

Illustrative Example Calculations of SGPA and CGPA for an academic year

Semester (Odd/Even/ Supplementary)	Course Code	Credits	Grade Obtained	Grade Points	Credit Points	SGPA, CGPA
I	MJXXX001	5:0:0	B	8	5 x 8 = 40	SGPA= 117/20 =5.85
I	MJXXX002	3:2:0	W	-	-	
I	MJXXX003	3:0:0	A	9	3 x 9 = 27	
I	MJXXX004	0:1:1	F	0	00	
I	MJXXX005	4:1:0	D	6	5 x 6 = 30	
I	MJXXX006	5:0:0	E	4	5 x 4 = 20	
	Total	**20 (18*)**		**Total**	**117**	

II	MJXXX007	3:1:1	C	7	7 x 5 = 35	SGPA =157/25 = 6.28 CGPA
II	MJXXX008	4:0:0	B	8	8 x 4 = 35	
II	MJXXX009	3:0:0	D	6	3 x 6 = 18	
II	MJXXX010	4:1:0	E	4	5 x 4 = 20	
II	MJXXX011	2:1:1	A	9	4 x 9 = 36	

II	MJXXX012	2:0:0	F	0	00	=274/41 = 6.68
II	MJXXX013	0:2:0	B	8	2 x 8 = 16	
Total		**25 (23*)**	**Total**		**157**	

Supplementary	MJXXX002	3:2:0	D	6	5 x 6 = 30	SGPA = 56/9 = 6.22
Supplementary	MJXXX004	0:1:1	C	7	2 x 7 = 14	
Supplementary	MJXXX012	2:0:0	D	6	2 x 6 = 12	CGPA =330/50 = 6.60
Total		**9**	**Total**		**56**	

Note: Minimum CGPA to be earned at the end of each academic year is 5.0. SGPA and CGPA are normally calculated to the second decimal position, so that the CGPA, in particular, can be made use of in preparing the rank list of the student's performance at the college. If two students get the same CGPA, the tie would be resolved by considering the number of times a student has obtained higher SGPA and if it is still not resolved, the number of times a student has obtained higher grades like S, A, B etc., would be considered.

19 **Vertical Progression**

19.1 **For Regular students**

i. The CGPA has to be ≥ 5.00 at the end of each the academic year. However, failure to secure a minimum CGPA of 5.00 at the end of any academic year for the first time shall attract warning before approval to continue in the semester to follow.

ii. Faculty Advisor (Mentor) / Head of the Department shall advice the students to maintain a CGPA of ≥ 5.00.

iii. Should not have 'F' Grade in more than FOUR courses (Excluding Non-Credit Mandatory Courses).

iv. For admission to 3rd Semester student should not have 'F' Grade in more than FOUR courses in 1st,2ndand supplementary semesters put together

v. For admission to 5th Semester students can carry any FOUR courses of 1st and 2nd year i.e. 1st to 4th and supplementary semesters put together.

vi. For admission to 7th B.E. the students should have completed all the courses of first year and can carry any FOUR courses of 2nd and 3rd year i.e. 3rd to 6thand supplementary semesters put together.

19.2 **For Diploma Holders (Lateral Entry)**

i. The CGPA has to be ≥ 5.00 at the end of the academic year. However, failure to secure a minimum CGPA of 5.00 at the end of any academic year for the first time shall attract

			warning before approval to continue in the semester to follow. ii. Faculty Advisor (Mentor) / Head of the Department shall advice the students to maintain a CGPA of ≥ 5.00 at the end of each semester. iii. Should not have 'F' Grade in more than FOUR courses (Excluding Non-Credit Mandatory Courses). iv. For admission to 5th Semester students can carry any FOUR courses of 2nd year i.e. 3rd, 4thand supplementary semesters put together. v. For admission to 7th semester B.E. the students should have completed all the courses of first year and can carry any FOUR courses of 2nd and 3rd year i.e. 3rd to 6thand supplementary semesters put together. vi. Students admitted to Bachelor of Engineering at the III semester level will have to study mandatory non-credit courses "Additional Mathematics-1" in III semester and "Additional Mathematics-2" in V semester respectively. However, a pass or fail in this is not considered in vertical progression provided the attendance and CIE requirements are satisfied. vii. If student fails to satisfies attendance and CIE requirements has to reregister for the course to make him/herself to appear for SEE viii. Completion of "Additional Mathematics-1 and Additional Mathematics-2" is mandatory for award of degree.
	19.3		**For B.Sc. students (Lateral Entry)** i. The CGPA has to be ≥ 5.00 at the end of the academic year. However, failure to secure a minimum CGPA of 5.00 at the end of any academic year for the first time shall attract warning before approval to continue in the semester to follow. ii. Faculty Advisor (Mentor) / Head of the Department shall advice the students to maintain a CGPA of ≥ 5.00 at the end of each semester. iii. Should not have 'F' Grade in more than FOUR courses (Excluding Non-Credit Mandatory Courses). iv. For admission to 5th Semester students can carry any FOUR courses of 2nd year i.e. 3rd, 4th and supplementary semesters put together. v. For admission to 7th B.E. the students should have completed all the courses of first year and can carry any FOUR courses of 2nd and 3rd year i.e. 3rd to 6th and supplementary semesters put together. vi. Students admitted to Bachelor of Engineering at the III semester level will have to study additional courses. Like 'Engineering Graphics and Elements of Civil Engineering and Mechanics' in addition to the regular courses from III to VIII semester. However, a pass or fail in these is not considered in vertical progression provided the attendance and CIE

			requirements are satisfied. vii. If student fails to satisfies attendance and CIE requirements has to reregister for the course to make him/herself to appear for SEE viii. Completion of mandatory non-credit courses "Engineering Graphics and Elements of Civil Engineering and Mechanics are mandatory for award of degree.
20			**Award of Degree**
	20.1		**Degree is awarded to students satisfying the following requirements:** i. Students have registered for courses totalling to credits given in Table 4.1. ii. Should not have any transitional grades (I, W, X, NE, DP) in any of the courses. iii. Should have CGPA ≥ 5.00 at the end of last semester. In case, if the students not fulfil this requirement are permitted to appear again for SEE in full or Part of the previous year theory course/s by rejecting the performance of them (other than internship, technical seminar, project and laboratories) for any number of times subject to the provision of maximum duration of the programme, to make up the CGPA greater than or equal to 5.00 for the award of degree. iv. Should have passed in all the prescribed mandatory courses. v. Should have earned the desired number of activity points as per the AICTE' activity point programme as per clause 27 vi. Should not have any pending disciplinary proceedings. vii. Should not have dues to the institute.
	20.2		**For award of B.E. (Honours) degree** A student shall be declared to have completed the Programme B.E. degree and shall be eligible to get B.E. degree with Honours, provided, i. Should have undergone the stipulated Course work of all the semesters under the same scheme of Teaching and Examinations and has earned prescribed number of credits as per clause 4 ii. Should have maintained CGPA ≥ 8.5 without any backlogs. **iii.** Has earned additional 18 or more credits by earning final score ≥ 60% through University approved online courses like Swayam. NPTEL etc.
21			**Academic Counselling Cell** After the first test, the faculty in-charge reports to the HoD, about the students who have scored less than the minimum requirement of 40% in first two quizzes and first test. HoD, faculty in-charge and proctor counsel such students and advise them regarding the course to be dropped so that, he/she can concentrate on other courses and perform better. The HoD and proctor takes an undertaking from such students to the effect that he/she:

- Shall attend all lectures, tutorials and laboratory classes regularly.
- Shall not miss any quizzes and Tests.
- Shall submit assignments regularly.
- Shall work hard to improve his/her academic performance.

22

Students Counselling Cell

The functions of Students Counselling Cell are to,

i. Identify academically deficient and disturbed/distressed students through proctors and counsel them. Monitoring of such students with the help of psychiatrist and medical officer.

ii. Explore ways and means to help the students to come out psychological issues.

iii. Assign student mentor for regular monitoring of academic activities

23

Malpractice in Examinations

Penalties and punishments to the students involved in malpractice during the examination.

Sl. No.	Nature of Malpractice	Penalty to be imposed
1.	Any form of revealing the identity of the candidate in the answer script of Semester End	Fine of Rs. 2500/- and award of F grade for that course.
2.	Possession of Manuscript printed or typed matter, Books or notes and written matter on Calculator / Instrument Box / electronic / wireless devices / Mobile phones, pen drives etc., or having any other written matter on the person (For Example, Palm, Hand, Leg, Cloths, Socks etc.,).	To deny the benefit of performance of the examination of all the courses for which the candidate has appeared by awarding **'F' Grade** in all the courses (both attended and to be attended of the particular examination conducted including arrear course if any), debar them for a further number of chances extending up to two semesters of examinations in all the courses including the arrears courses.
3.	Detection of identical answers in the answer scripts of different Candidates or allowing a candidate to copy from his/her answer script.	To deny the benefit of performance of the examinations of all the courses for which the candidate has appeared by awarding **'F' Grade** in all the courses (both attended and to be attended of the particular examination conducted including arrear course if any), debar them for a further number of chances extending up to two semesters of examinations in all the courses including the arrears courses.

				4.	Appeal to the examiner with or without money as enclosures to the SEE answer book / use of abusive / obscene language or threatening remarks in the SEE answer book.	To deny the benefit of performance of the examinations of all the courses for which the candidate has appeared by awarding **'F' Grade** in all the courses (both attended and to be attended of the particular examination conducted including arrear course if any), debar them for a further number of chances extending up to two semesters of examinations in all the courses including the arrears courses.	
				5.	Found giving or receiving assistance at the examination, passing the question paper with written answer / formulae / answer script / additional sheet / Graph Sheet / Drawing Sheet for purpose of copying.	To deny the benefit of performance of the examinations of all the courses for which the candidate has appeared by awarding **'F' Grade** in all the courses (both attended and to be attended of the particular examination conducted including arrear course if any), debar them for a further number of chances extending up to two semesters of examinations in all the courses including the arrears courses.	
				6.	Destroying the documentary evidence of malpractice.	To deny the benefit of performances of the examination of all the courses for which the candidate has appeared (both attended and to be attended of the particular examination conducted including arrear examinations) and debar him/her for a further number of chances extending up to Two more examinations.	
				7.	Insertion of additional sheets / Graph Sheets / Drawing Sheets, use of answer book which is not issued at the examination hall on that particular examination date.	To deny the benefit of performances of the examination of all the courses for which the candidate has appeared (both attended and to be attended of the particular examination conducted including arrear examinations) and debar him/her for a further number of chances extending up to Two more examinations.	
				8.	In case of Impersonation or found guilty of deliberate prior arrangement to cheat in the examination.	To deny the benefit of performances of the examination of all the courses for which the candidate has appeared and who has arranged another person to impersonate (both attended and to be attended of the particular examination conducted including arrear examinations to both the candidates) & debar him/her for a minimum of six more examinations. (for the person who has impersonated and on whom impersonation is done for both persons, the punishment shall extend up to reprimanding and also booking a case under Indian Penal Code-IPC.	

			9.	Abusing, threatening, and manhandling the examination authorities at the examination hall or in the premises of the examination centre / outside the centre as well as misconduct of a very serious nature.	To deny the benefit of performances of the examination of all the courses for which the candidate has appeared and who has arranged another person to impersonate (both attended and to be attended of the particular examination conducted including arrear examinations to both the candidates) & debar him/her for a minimum of six more examinations. (for the person who has impersonated and on whom impersonation is done for both persons, the punishment shall extend up to reprimanding and also booking a case under Indian Penal Code-IPC.	
			10.	Any other Malpractices not defined above but connected with the Examination.	Committee can recommend suitable penalties as deem fit.	
			The Chief superintendent shall allow the candidate to write all subsequent examinations and send the answer books to the office of the Controller of Examinations (CoE) on the following day.			
			The Examiner shall, if he / she suspects' malpractice while valuing the answer scripts or other material such as insertion of answer sheets, revealing of identity or enclosures, such as currency, shall return the answer scripts with reason in writing to the CoE by name and desist from further valuation. If already valued, marks shall not be entered in the regular marks list in which the marks awarded to other candidates are furnished but enter them in a separate list which shall be enclosed in a sealed cover and forwarded to the CoE. The decision pertaining to above Penalties and Punishments may be communicated to all the concerned. Enquiry under Malpractice Cases Consideration Committee is independent of the criminal proceedings. If any, in the appropriate court of law.			
			Malpractice in Quizzes / Tests			
			If a student is involved in malpractices as defined for SEE in any course(s) of quiz / I test / II test / compensatory test.	'NE' graded will be awarded for that course in that semester. He /She will not be permitted to appear for SEE for that course. He /She will not be permitted to Drop / Withdraw that course.		
			However, depending on severity of malpractice, MPEC will impose penalty as deem fit, other than the one mentioned above.			
24			**Rules and Discipline**			

			In order to maintain the sanctity and decorum in the campus and hostels, the following rules of discipline are observed by students: - The students should behave courteously with the members of the staff. - They should maintain silence in the library, classrooms and work quietly in drawing halls, laboratories and workshops. - Students coming late to the classes are not permitted to enter the class rooms. - They should not meddle with the machines, equipment and tools in the laboratories and workshops without the permission of the staff members in charge. They will be responsible for the damages and will have to pay for their replacement. - They should not absent themselves from the classes without the prior permission of the Principal. - Students should take the entire test without fail. - Students are forbidden from pasting posters in the institute premises and causing any damage to the property of the institute. - Smoking, consumption of alcoholic beverages and drugs are strictly forbidden. - Students are not to affix any notice or remove any office notice from the notice boards. - Use of Cell Phone is banned in classrooms, laboratories, library and in academic corridor. - Students using vehicles are required to leave them in parking places provided and are forbidden from parking in other places inside the campus causing disturbance to the classes.
25			**Ragging and Punishment**
	25.1		**Ragging:** Ragging means causing, inducing, compelling, forcing a student either by way of practical joke or otherwise, to do any act which detracts from human dignity or violates his/her person or exposes him/her to ridicule or to forebear from doing any lawful act by intimidating, wrongfully restraining, wrongfully confining, or injuring him/her or by using criminal force, extortion. The following perverse actions also constitute the ragging. i) Forcing to: Address seniors as SIRs, perform mass drills, copy class notes and practical records for seniors, and carry out various errands. Do menial jobs for seniors, Drink alcohol and consume drugs. Do acts with sexual overtones and homosexual acts leading to physical injury/mental torture or death. ii) Stripping / Kissing **iii)** Any other related or allied acts of commission would also from ragging.

	25.2		**Punishment for Errant Students (Raggers)** i) Filing of First Information Report (FIR) with the local police as per the Supreme Court direction. ii) Publishing the photographs of errant students (raggers) on the Notice Boards and in Local Newspapers. iii) Imprisonment for a term extendable up to one year or a fine of Rs. 2000/- or both. iv) Rustication, dismissal and expulsion from the Institute. v) Embossment on marks cards and other academic certificates that he/she was indulged in ragging. vi) Non eligibility for getting passport or visa. **vii)**Non eligibility for campus recruitment/cancellation, if selected already.
26			**Disciplinary Actions and Related Matters** i. Violation of code of conduct and disciplinary rules of the institute will be referred to the disciplinary committee. **ii.** Violation of code of conduct shall attract disciplinary action which may include punishment such as reprimand, disciplinary probation, fine, debarring from the examination, withdrawal of placement facilities, withholding grades/degree, cancellation of registration and even rustication from the institute.

27

Activity Point Programme

To enhance student's skills sets and along with an entrepreneurial capabilities and societal commitment to be apart from his/her Technical knowledge and skills to become successful as professionals, AICTE has brought a comprehensive activity programme for the award of Degree.

AICTE has framed a unique mechanism of awarding activity points over and above the academic programme grades and is mandatory for the student to earn desired number of activity points, where every student can choose activities as per likings in order to earn the AICTE activity points. These activities can spread over the years during the entire program as per the convenience of the student.

Table No. 27 Number of activity points to be earned

Sl. No	Level entry in the degree	Minimum Points to be earned
1	Day college Student admitted to 4 years Degree Programme	100
2	Student entering 3 years Degree programme through lateral entry	75
3	Students transferred from other Universities to fifth Semester	50

i. Activity points (non-credit) have no effect on SGPA/CGPA and will not be considered for vertical progression

ii. Activity points earned by the student will be reflected in the 8th semester Grade Card

iii. In case student fail to earn the minimum prescribed activity points before the commencement of 8th semester examinations, the eight semester grade card will be issued only after earning the minimum prescribed activity points.

iv. Students will be considered for the award of degree only after the release of 8th semester Grade Card.

28

Termination from the Program

A student is required to withdraw from the program and leave the Institute on the following grounds;

i. Failure (securing F grade) in any credit course/s for five consecutive attempts.

ii. Failure to secure a CGPA ≥ 5.0 at the end each academic year,for the first time attracts a warning before approval to continue in the following semester. However, a student failing to secure CGPA ≥ 5.0 in five consecutive semesters has to withdraw from the engineering program. However, the student can take re-admission to 1st year.

iii. Failure to meet the standards of discipline as prescribed by the Institute from time to time.

29			**Migration of Students**
	29.1		**Change of branch** Change of branch shall be during the beginning of III semester as per VTU/AICTE norms with permission of Registrar, VTU.
	29.2		**Change of College** **A.** Autonomous to another Autonomous College i. Students shall seek Change of College at beginning of 3rd and 5th semester from an autonomous college to another autonomous college subject to the availability of seats within the approved intake. ii. The students seeking transfer as per clause 29.2 (A) (i) shall have to obtain No Objection certificate from the University by producing No Objection certificates from both the colleges during the period as notified by VTU. iii. No transfer is permitted to 7th semester B.E. programme. iv. Must have passed in all courses of previous semesters v. Complete additional course/s, if any, as per decision of Board of Studies on establishing matching equivalence between two schemes. Number of such additional courses shall not be more than four. A grade card shall be issued to that effect. Additional course/s shall not be considered for vertical progression, calculation of SGPA and CGPA. However, a pass in the additional course/s is mandatory for award of degree. vi. Shall earn the credits and complete the program within the maximum duration as per clause 4 vii. If the number of credits earned is less than the prescribed after the completion of all semesters of the programme under prevailing scheme, student shall register for a course or courses which are not studied earlier and make up the credits earned equal to or greater than required for the award of degree viii. If earned credits are more than prescribed, then CGPA shall be proportionally reduced to prescribed proramme credits. **B. Autonomous to Non- Autonomous College** i. Students shall seek Change of College at beginning of 3rd and 5th semester from an autonomous college to another autonomous college subject to the availability of seats within the approved intake. ii. The students seeking transfer as per clause 29.2 (B) (i) shall have to obtain No Objection certificate from the University by producing No Objection certificates from both the colleges during the period as notified by VTU. iii. No transfer is permitted to 7th semester B.E. programme.

			iv. Must have passed in all courses of previous semesters v. Shall adhere to the prevailing regulations governing transfer of students at the University
	29.3		**Change of University** i. Students seeking Change of College from one University (other than VTU) to an Autonomous college at beginning of 3rd and 5th semester subject to the availability of seats within the approved intake. ii. The students seeking transfer as per clause 29.3 (i) shall have to obtain No Objection certificate from the University by producing No Objection certificates from both the colleges during the period as notified by VTU. iii. No transfer is permitted to 7th semester B.E. programme. iv. Must have passed in all courses of previous semesters v. Complete additional course/s, if any, as per decision of Board of Studies on establishing matching equivalence between two schemes. Number of such additional courses shall not be more than four. A grade card shall be issued to that effect. Additional course/s shall not be considered for vertical progression, calculation of SGPA and CGPA. However, a pass in the additional course/s is mandatory for award of degree. vi. Shall earn the credits and complete the program within the maximum duration as per clause 4 vii. If the number of credits earned is less than the prescribed after the completion of all semesters of the programme under prevailing scheme, student shall register for a course or courses which are not studied earlier and make up the credits earned equal to or greater than required for the award of degree viii. If earned credits are more than prescribed, then CGPA shall be proportionally reduced to prescribed programme credits.
30			**Award of Ranks, Medals and Prizes**
	30.1		i. For award of ranks in a specialization of B.E. the CGPA secured by the student from III to VIII semesters shall be considered ii. The additional credits earned for award of Honours degree shall not have any bearing for the declaration of rank iii. A student shall be eligible for a rank at the time of award of degree provided, the student, a) Has passed all the courses of I to VIII semesters in first attempt only in case student

			admitted to I year of the programme b) Has passed the courses (including mandatory non-credit) of III to VIII semesters in first attempt only in case student admitted to II year of the programme under lateral entry scheme. c) Not a repeater in any semester due to rejection of result/shortage of attendance etc d) Completed the course without any break/discontinuity e) Has not been transferred from any autonomous/ non-autonomous/University f) Total number of ranks awarded shall be 10% of the total students appeared for VIII the examination to a maximum of 10 ranks in a specialization g) Ranks in a specialization shall be awarded only if a minimum of 10 should have appeared in the VIII semester examinations h) In case fractional number of ranks, shall be rounded to higher integer only when the first decimal place is greater than or equal to 5.
	30.2		i. Ranks will be awarded based on the merit of the students as determined by CGPA. If more than one candidate has the same CGPA, then tie shall be resolved by considering number of times student has obtained higher SGPA. If it is not resolved even at this stage, then the award of rank shall be based on number of S-grades/number of A-grades/any other relevant criteria. ii. Ranks and awards are given for those students who were not involved in malpractice in test/quiz/examination and on whom no disciplinary action taken.
	30.3		Medals and Prizes shall be awarded based on the conditions stipulated by the Donor subject to the provisions of regulations framed for such awards.

MVJ College of Engineering, Whitefield, Bangalore

An Autonomous Institution, Affiliated to VTU, Belagavi

Scheme of Teaching and Examination 2020-21

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

Effective from the academic year 2020-21

Department of Data Science

III SEMESTER B.E. (6 Theory, 2 Labs, 1 Kannada/CPH, 1 MATDIP, 1 AICTE Activity)

S No	Course		Course Title	Teaching Department	Teaching hours/week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total marks	
	Type	Code			L	T	P					
1	BSC	MVJ20MIS31/CD31	Discrete Math & Probability Theory	Mathematics	2	2	0	3	50	50	100	3
2	PCC	MVJ20CD32	Data Structure	DS Dept	3	2	0	3	50	50	100	4
3	PCC	MVJ20CD33	Software Testing	DS Dept	3	1	0	3	50	50	100	3
4	PCC	MVJ20CD34	Python Programming	DS Dept	3	1	0	3	50	50	100	3
5	PCC	MVJ20CD35	Optimization Methods	DS Dept	4	0	0	3	50	50	100	3
6	PCC	MVJ20CD36	Professional Ethics in computing	DS Dept	4	0	0	3	50	50	100	3
7	PCC	MVJ20ISL37/CDL37	Data Structure Lab	DS Dept	0	1	2	3	50	50	100	2
8	PCC	MVJ20CDL38	Python Programming Lab	DS Dept	0	1	2	3	50	50	100	2
9	HSMC	MVJ20KAN39	Kannada	Humanities	1	0	0	3	50	50	100	1
		MVJ20CPH39	CPH					3	50	50		
10	HSMC	MVJ20UHV310	UHV-I	DS Dept	1	0	0	3	50	50	100	1
11	NCMC	MVJ20MATDIP31	Additional Mathematics-1	Mathematics					50	50	100	-
12	NCMC	AICTE Activity for 80-90 hours (20 points)		-	-	-	-	-	-	-	-	-
				Total	21	8	4	30	500	500	1000	**25**

Note: BSC: Basic Science, PCC: Professional Core Course, HSMC: Humanity and Social Science
MVJ20MXXDIP301- Mandatory non-credit course, NCMC: Non-credit mandatory course

Course Title	Discrete Math & Probability Theory	Semester	III
Course Code	MVJ20MCD31	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 2 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Prepare for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science.
- Understand and apply mathematical induction, combinatorics, discrete probability, sequence and recurrence, elementary number theory.
- Understand and apply probability distribution, sampling theory and joint probability distributions.

Module-1	L1,L2,L3	12 Hours

Properties of the Integers: The Well Ordering Principle – Mathematical Induction. Principles of Counting: Fundamental Principles of Counting, The Rules of Sum and Product, Permutations, Combinations – The Binomial and Multinomial Theorem, Combinations with Repetition.

Application: Distribution with repetition.

Video Link:
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/

Module-2	L1,L2,L3	12 Hours

The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle. Derangements – Nothing is in its Right Place, Rook Polynomials.

Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients.

Application: Arrangement with forbidden position.

Video Link:
1. http://nptel.ac.in/courses.php?disciplineID=111

2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-3	L1,L2,L3	12 Hours
Relations: Cartesian Products, Relations, Properties of Relations, Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions. Functions: Plain and One to One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Application: Zero-one matrix and Hasse diagram Video Link: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-4	L1,L2,L3	12 Hours
Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems. Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient. Application: Finding correlation between random variables. Video Link: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-5	L1,L2,L3	12 Hours
Sampling Theory: Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution and Chi-square distribution. Coding Theory: Coding of binary information and error detection, decoding and error detection. Application: Testing the level of significance & the goodness of fit for large sample and small sample. Video Link: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		

Course outcomes:	
CO1	Demonstrate the application of discrete structures in different fields of computer Science.
CO2	Solve problems using recurrence relations and generating functions.
CO3	Solving logical problem using concepts of relations and functions.
CO4	Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and Design engineering.
CO5	Demonstrate testing of hypothesis of sampling distributions.

Reference Books:	
1.	Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearso Education. 2004.
2.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
3.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
4.	Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007
5.	Basavaraj S Anami and Venakanna S Madalli: Discrete Mathematics – A Concept based approach, Universities Press, 2016.

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	0	3	0	0	0	0	0	0	1	1
CO2	2	3	0	3	0	0	0	0	0	0	1	1
CO3	2	3	0	3	0	0	0	0	0	0	1	1
CO4	3	3	0	3	0	0	0	0	0	0	1	1
CO5	3	3	0	3	0	0	0	0	0	0	1	1

High-3, Medium-2, Low-1

Course Title	Data Structure	Semester	III
Course Code	MVJ20CD32	CIE	50
Total No. of Contact Hours	50	SEE	50
No. of Contact Hours/week	5 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to:

- Understand the various techniques of sorting and searching
- Design and implement arrays, stacks, queues, and linked lists
- Understand the complex data structures such as trees and graphs

Module-1	L1,L2,L3	12 Hours

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

Laboratory Sessions/ Experimental learning:

- Implementation of searching Techniques

Applications: Array data type used in a programming language to specify a variable that can be indexed. Array data structure is used for arrangement of items at equally spaced and sequential addresses in computer memory makes it easier to perform operations like sorting, merging, traversal, retrievals

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/array_data_structure.htm

Module-2	L1,L2,L3	12 Hours

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

Laboratory Sessions/ Experimental learning:

- Stack ADT to perform push and pop operations.
- Stack ADT for Expression Evaluation
- Array Implementation of Queue ADT

Applications: Expression Handling , Backtracking Procedure

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/stack_algorithm.htm
https://www.tutorialspoint.com/data_structures_algorithms/dsa_queue.htm

Module-3	L1,L2,L3	12 Hours

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

Laboratory Sessions/ Experimental learning:

- Implementation of linked list techniques(SLL,DLL,CLL)

Applications: The cache in your browser that allows you to hit the BACK button where a linked list of URLs can be implemented. A linked list would be a reasonably good choice for implementing a linked list of file names, undo functionality in Photoshop

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/linked_list_algorithms.htm
https://www.tutorialspoint.com/data_structures_algorithms/doubly_linked_list_algorithm.htm

Module-4	L1,L2,L3	12 Hours

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

Laboratory Sessions/ Experimental learning:

- Develop a program to create a Binary Search Tree and to Traverse the tree.

Applications: Store hierarchical data, like folder structure, organization structure, XML/HTML data. Binary Search Tree is a tree that allows fast search, insert, delete on a sorted data. It also allows finding closest item. Heap is a tree data structure which is implemented using arrays and used to implement priority queues.

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/tree_data_structure.htm
https://www.tutorialspoint.com/data_structures_algorithms/binary_search_tree.htm

Module-5	L1,L2,L3	12 Hours

Introduction to graph – types of graphs - Graph representations - Traversal algorithms- Depth First Search (DFS) and Breadth First Search (BFS) - Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting.

Laboratory Sessions/ Experimental learning:

- Implement shortest path Algorithms

Applications: The link structure of a website could be represented by a directed graph: the vertices are the web pages available at the website and a directed edge from page A to page B exists if and only if A contains a link to B. Graph colouring concept can be applied in job scheduling problems of CPU, jobs are assumed as vertices of the graph and there will be an edge between two jobs that cannot be executed simultaneously and there will be one-one relationship between feasible scheduling of graphs.

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/graph_data_structure.htm

Course outcomes:	
CO1	Implement all the operations of linear data structures to store and retrieve the given data.
CO2	Create a hierarchical data structure to represent the given data using tree data structure.
CO3	Compare efficiency of various searching techniques using different tree data structures.
CO4	Apply stack, Queue, Lists, Trees and Graph concepts in problem solving
CO5	Implement all data structures in a high-level language for problem solving

Reference Books:	
1.	Seymour Lipschutz and Vijayalakshmi Pai G A, –Data Structures‖, Tata McGraw Hill, New Delhi, 2013.
2.	Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, Fundamentals of Data Structures in C, Second Edition, Universities Press, 2008.
3.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2015

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	0	0	0	0	2	0	0
CO2	3	3	3	2	3	0	0	0	0	2	0	0
CO3	3	3	2	2	3	0	0	0	0	2	0	0
CO4	3	3	2	2	3	0	0	0	0	2	0	0
CO5	3	3	3	2	3	0	0	0	0	2	0	0

High-3, Medium-2, Low-1

Course Title	Software Testing	Semester	III
Course Code	MVJ20CD33	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Understand HTML and CSS for designing web pages.
- Understand basics of JavaScript as a programming language.
- Understand the Document Object Model and enable them to create dynamic web pages that react to user input.
- Understand installing and configuring Apache Server and incorporating backend support for their web pages.
- Get exposure to the newer features available as part of the HTML standard

Module-1	L1,L2,L3	12 Hours

Syllabus Content: Basics of Software Testing: Basic definitions, Software Quality, Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies, Levels of testing, Testing and Verification, Static Testing. Problem Statements: Generalized pseudocode, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem, the currency converter, Saturn windshield wiper

Application: software systems

Video Link: https://www.youtube.com/watch?v=cv6GvRCIuTs

Module-2	L1,L2,L3	12 Hours

Syllabus Content:

Black Box Testing Types of Black Box Testing Techniques: Boundary Value Testing, Normal Boundary Value Testing Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing Guidelines for Boundary Value Testing

Equivalence Class Testing Equivalence Classes, Traditional Equivalence Class Testing Improved Equivalence Class Testing, Equivalence Class Test Cases for the Triangle

Problem, Equivalence Class Test Cases for the NextDate Function, Equivalence Class Test Cases for the Commission Problem, Edge Testing Decision Table–Based Testing Decision Tables, Decision Table Techniques Test Cases for the Triangle Problem, Test Cases for the Next Date Function, Test Cases for the Commission Problem Application: Multilanguage support and compatibility Testing Video Link: https://www.youtube.com/watch?v=2MRU2oRUlDo		
Module-3	L1,L2,L3	12 Hours
Syllabus Content: Evaluating Test Cases Mutation Testing, Fuzzing, Fishing Creel Counts and Fault Insertion Software Technical Reviews Economics of Software Reviews, Roles in a Review Types of Reviews, Contents of an Inspection Packet, An Industrial Strength Inspection Process, Effective Review Culture,Inspection Case Study Application: Pit mutation testing Video Link: https://www.youtube.com/watch?v=mZjPzlX9YJY		
Module-4	L1,L2,L3	12 Hours
Syllabus Content: Integration and Component-Based Software Testing: Overview, Integration testing strategies, Testing components and assemblies. System, Acceptance and Regression Testing: Overview, System testing, Acceptance testing, Usability, Regression testing, Regression test selection techniques, Test case prioritization and selective execution. Levels of Testing, Integration Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing, A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integration Application: Online delivery system Video Link: https://www.coursera.org/lecture/engineeringandroidapps/integration-testing-FbJOF		
Module-5	L1,L2,L3	12 Hours
Syllabus Content: Software test automation – skill needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.		

Application: TestSigma Video Link: https://www.edureka.co/blog/test-automation-strategy/
Practical Experiments: 1. Study of any testing tool. 2. Study of any web testing tool 3. Study of any bug tracking tool 4. Study of any test management tool. 5. Case study on Selenium.

Course outcomes:	
CO1	Apply the concepts of Quality Engineering.
CO2	Design Test cases for various black box testing techniques
CO3	Plan, employ and measure proper Quality approaches applied.
CO4	Apply the appropriate technique for the design of flow graph.
CO5	Create automation test scripts

Text/Reference Books:	
1.	Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 4th Edition, Auerbach Publications, 2013.
2.	Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009.
3.	Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008
4.	Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2nd Edition, Pearson, 2007
5.	Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1				2		2		2				1
CO2		3		2		2		2				2
CO3		3		2		2		2				3
CO4		3		2		2		2				2
CO5		3		2		2		2				3

High-3, Medium-2, Low-1

Course Title	Python Programming	Semester	III
Course Code	MVJ20CD34	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to: *This course will enable students to*

- Learn fundamental features of object-oriented language
- Design, write, debug, run Python Programs
- Develop console -based applications using Python
- Develop console & windows applications using Python.
- Introduce event driven Graphical User Interface (GUI) programming using Python built in functions

Module-1	L1,L2,L3	12 Hours

Syllabus Content:

Why should you learn to write programs, Introduction to Python, Variables, expressions and statements, Conditional execution, Functions.

Application:

- In learning and implementing small project process

Video Link:

1. https://www.py4e.com/
2. http://greenteapress.com/wp/think-python/

Module-2	L1,L2,L3	12 Hours

Syllabus Content: Iteration, Strings, Files.

Application:

- Pattern recognition and Reading resultant column in supervised learning data set

Video Link:

1. https://www.codecademy.com/learn/learn-python
2. http://www.tutorialspoint.com/python/

Module-3	L1,L2,L3	12 Hours

Syllabus Content:

Lists, Dictionaries, Tuples, Regular Expressions.

Application:

- Handling query languages and Managing Large set of data with respect to database

Video Link:

1. https://www.programiz.com/python-programming/class
2. https://www.udemy.com/course/web-scraping-with-python-beautifulsoup/

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Classes and objects, Classes and functions, Classes and methods.

Application:

- Designing games and puzzles

Video Link:

1. https://datatofish.com/json-string-to-csv-python/
2. https://automatetheboringstuff.com/

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

Networked programs, Using Web Services, Using databases and SQL.

Application:

- Music composition and movie development

Video Link:

1. http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf
2. https://www.datacamp.com/community/tutorials/reading-and-editing-pdfs-and-word-documents-from-python

Practical Experiments:
• Programs related to Basic concepts of Python like Operators, Control flow and Iterations. • Programs related to Functions, Strings, Files, Lists and Multi-Dimension Lists • Installation and use of special Modules like pip, Wiki etc. • Implementation of Python Program with a Database.

Course outcomes:	
CO1	Understand Python syntax and semantics and be fluent in the use of Python flow control and functions.
CO2	Demonstrate proficiency in handling Strings and File Systems.
CO3	Implement Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
CO4	Interpret the concepts of Object-Oriented Programming as used in Python.
CO5	Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Text/Reference Books:	
1.	Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, CreateSpace Independent Publishing Platform, 2016. (http://do1.drchuck.com/pythonlearn/EN_us/pythonlearn.pdf)
2.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2ndEdition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf)
3.	Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd. ISBN-13: 978-8126556014

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		2							
CO2	2	2	3		2							
CO3	3	2	3		2							
CO4	2	1	3		2							
CO5	2	1	3		2							

High-3, Medium-2, Low-1

Course Title	Optimization Methods	Semester	III
Course Code	MVJ20CD35	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Provide introduction to linear programming techniques .
- Provide theoretical foundation and the fundamental algorithms for linear & non-linear optimization.
- Provide introduction to multi-channel queuing models.

Module-1	L1,L2,L3	12 Hours

Linear Programming-Graphical Solution- The Simplex algorithm, Artificial Variable Technique -Duality-Dual Simplex - Variants of the Simplex Method Transportation Model Initial Basic Feasible Solution methods Test for optimality-Variants of the Transportation
problem

Application:

logistic regression.

Video Link:

https://www.youtube.com/watch?v=4Xokcy8jeoI

Module-2	L1,L2,L3	12 Hours

Assignment Model- Hungarian algorithm Variants of the Assignment problem, Travelling Salesman Problem Integer Linear Programming- Gomary's cutting plane method Branch and Bound method

Application:

Numerical solution of linear systems.

Video Link:

https://www.youtube.com/watch?v=Q2dewZweAtU

Module-3	L1,L2,L3	12 Hours
Sequencing Problem - N jobs through 2 machines, N Jobs through 3 machines, N jobs through m machines Scheduling - Critical path Method, Project Evaluation and Review Techniques Application: Stochastic gradient descent. Video Link: https://www.youtube.com/watch?v=x6f5JOPhci0		
Module-4	L1,L2,L3	12 Hours
Introduction to constrained nonlinear optimization theory, Inventory control - Purchase and production model with and without shortage , price break. Application: constrained nonlinear optimization Video Link: https://www.youtube.com/watch?v=TudQZtgpoHk		
Module-5	L1,L2,L3	12 Hours
Queuing Model- Single channel model, Multichannel model. Application: Quadratic programs Video Link: https://www.youtube.com/watch?v=csG_qfOTvxw		

Course outcomes:	
CO1	Apply linear programming techniques to optimize problems arising in communication engineering
CO2	Solve the assignment problem through Hungarian algorithm
CO3	Determine the optimum values of integer programming problems using Gomary's cutting plane method
CO4	Write well documented and structured optimization algorithm
CO5	Solve the single and multi-channel queuing models.

Reference Books:	
1.	Sharma J.K.: "Operations Research Theory and applications", Macmillan India Ltd., V Edition, 2015.
2.	Hamdy A. Taha: Operations Research – An Introduction", Prentice Hall of India Pvt Ltd., EIGHT Edition, 2014.
3.	Chandrasekara Rao, K. Shanti Lata Misra "Operation Research", Alpha science international Ltd-2015.
4.	Kanti Swarup, P.K.Gupta and Man Mohan "Operations Research", Sultan Chand,2014

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	2	2	0	0	0	0	0	0	0	1
CO2	3	3	2	2	0	0	0	0	0	0	0	1
CO3	3	3	3	2	0	0	0	0	0	0	0	1
CO4	3	3	2	2	0	0	0	0	0	0	0	1
CO5	3	3	3	2	0	0	0	0	0	0	0	1

High-3, Medium-2, Low-1

Course Title	Professional Ethics in Computing	Semester	III
Course Code	MVJ20CD36	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- To inculcate the sense of social responsibility.
- To develop a firm ethical base
- To make the students realize the significance of ethics in professional environment.

Module-1	L1,L2,L3	12 Hours

Profession ---- Definition
Three types of ethics.
Engineering ethics
Rights and responsibilities of an engineer

Application:

Engineering ethics

Video Link:

https://lib.pstcc.edu/csplagiarism

Module-2	L1,L2,L3	12 Hours

Evolution of engineering ethics
Code of ethics
Kohlberg‟s theory
Gilligan‟s theory

Application:

Business ethics, Outline of ethics

Video Link:

https://www.youtube.com/watch?v=jj1CsGgDgGM

Module-3	L1,L2,L3	12 Hours
Engineering as social experimentation Engineer‟s social responsibility Application: Professional boundaries Video Link: https://www.youtube.com/watch?v=OBrMUs_T9Fs		
Module-4	L1,L2,L3	12 Hours
Computer ethics Ethical hacking Privacy Application: Professional responsibility Video Link: https://www.youtube.com/watch?v=Ij3iILP7H-4		
Module-5	L1,L2,L3	12 Hours
Environmental ethics. Livable environment Technology assessment. Application: Virtue ethics		

Video Link: https://nptel.ac.in/courses/110/105/110105097/

Course outcomes:	
CO1	Ethical, social and environmental awareness.
CO2	Awareness on Engineer's rights and responsibilities
CO3	Act in morally desirable ways, towards moral commitment and responsible conduct
CO4	Integrating academic learning with experimental learning in a profession
CO5	Apply ethics in professional environment.

Reference Books:	
1.	Ethics in engineering: Mike W.Martin Roland, Mac Grow Hill.Schinzinger
2.	Engineerinethics---- M.Govindarajan, S.Natarajan&V.S.Senthil Kumar. Eastern economy Edn.PHI
3.	Engineering ethics-- Harris pitch and Rabbins, cengage.
4.	Caroline whit back---Ethics in engineering practice and research---- Cambridge.
5.	E-learning resources: http://nptel.ac.in/courses.php http://jntuk-coeerd.in/

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	2	2	0	0	0	0	0	0	0	
CO2	3	3	2	2	0	0	0	0	0	0	0	
CO3	3	3	3	2	0	0	0	0	0	0	0	
CO4	3	3	2	2	0	0	0	0	0	0	0	
CO5	3	3	3	2	0	0	0	0	0	0	0	

High-3, Medium-2, Low-1

Course Title	Data Structure Lab	Semester	III
Course Code	MVJ20CDL37	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 1 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

- Implement linear and non-linear data structures
- Understand the different operations of search trees
- Implement graph traversal algorithms
- Get familiarized to sorting and searching techniques

Sl No	Experiment Name	RBT Level	Hours
1	Implementation of searching algorithms a) Linear Search b) Binary Search	L3	4
2	Implementation of sorting algorithms a) Insertion sort b) Selection sort c) Quick sort d) Merge sort	L3	4
3	a) Array implementation of List ADT b) Linked list implementation of List ADT	L3	4
4	a) Array implementation of Stack ADT b) Linked list implementation of Stack ADT	L3	4
5	a) Array implementation of queue ADT b) Linked list implementation of queue ADT	L3	4
6	Program to create a Binary Search Tree and to traverse the tree.	L3	4
7	Program to compute the shortest path from a single source	L3	4
8	Program to construct a graph and perform graph traversal (BFS, DFS)	L3	4
9	Program to construct a minimum spanning tree using: a) Prims Algorithm b) Kruskal's Algorithm	L3	4

10	Development of a Mini project/Present a case Study	L3	4

Course outcomes:	
CO1	Compute the time and space complexity of searching and sorting algorithms with asymptotic notations.
CO2	Implement all the operations of linear data structures to store and retrieve the given data.
CO3	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data
CO4	Create a hierarchical data structure to represent the given data using tree data structure.
CO5	Design graph algorithms to compute the shortest path of the given graph and to identify the Minimum spanning tree.

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	3	2	3	0	0	0	0	2	0	0
CO2	3	3	3	2	3	0	0	0	0	2	0	0
CO3	3	3	2	2	3	0	0	0	0	2	0	0
CO4	3	3	2	2	3	0	0	0	0	2	0	0
CO5	3	3	3	2	3	0	0	0	0	2	0	0

High-3, Medium-2, Low-1

Course Title	Python Programming Lab	Semester	III
Course Code	MVJ20CDL38	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 1 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

- Gain knowledge in writing python programs to do a variety of programming tasks and develop various applications.

Sl No	Experiment Name	RBT Level	Hours
1	Python Program to Reverse a linked list	L3	3
2	Python Program for Find largest prime factor of a number	L3	3
3	Python Program for Efficient program to print all prime factors of a given number	L3	3
4	Python Program for Product of unique prime factors of a number	L3	3
5	Python Program for Find sum of odd factors of a number	L3	3
6	Python Program for Coin Change	L3	3
7	Python Program for Tower of Hanoi	L3	4
8	Python Program to Check if binary representation is palindrome	L3	4
9	Python Program for Basic Euclidean algorithms	L3	3
10	Python Program for Maximum height when coins are arranged in a triangle	L3	4

Course outcomes:

CO1	Write, Test and Debug Python Programs
CO2	Implement Conditionals and Loops for Python Programs
CO3	Use functions and represent Compound data
CO4	Read and write data from & to files in Python

CO5	Develop Applications using Python

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	0	0	0	0	0	0	0	0
CO2	3	3	2	2	0	0	0	0	0	0	0	0
CO3	3	3	3	2	0	0	0	0	0	0	0	0
CO4	3	3	2	2	0	0	0	0	0	0	0	0
CO5	3	3	3	2	0	0	0	0	0	0	0	0

High-3, Medium-2, Low-1

Course Title	CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND CYBER LAW	Semester	III
Course Code	MVJ20CPH39	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/Week	1 (L : T : P :: 1 : 0 : 0)	Total	100
Credits	01	Exam. Duration	2 hrs

Course objective is to:

To know the fundamental political codes, structure, procedures, powers, and duties of Indian constitution, Indian government institutions, fundamental rights, directive principles and the duties of the citizens.

To provide overall legal literacy to the young technograts to manage complex societal issues in the present scenario.

To understand engineering ethics & their responsibilities, identify their individual roles and ethical responsibilities towards society.

Module-1	RBT Level L1,L2,L3	03 Hours

Introduction to Indian Constitution

The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian Constitution, The Making of the Constitution, The role of the Constituent Assembly – Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and Limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and Significance in Nation Building.

Module – II	RBT Level L1,L2,L3	03 Hours

Union Executive and State Executive

Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Article 370, 371, 371J) for some States.

Module – III	RBT Level L1,L2,L3	03 Hours

Elections, Amendments and Emergency Provisions

Elections, Electoral Process, and Election Commission of India, Election Laws.

Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44,61,73,74,75,86, and 91,94,95,100,101,118 and some important Case Studies. Recent Amendments with explanation. Important Judgements with Explanation and its impact on society (from the list of Supreme Court Judgements). Emergency Provisions, types of Emergencies and it's consequences. **Constitutional Special Provisions:** Special Constitutional Provisions for SC & ST, OBC, Special Provision for Women, Children & Backward Classes.

Module – IV	RBT Level L1,L2,L3	03 Hours

Professional / Engineering Ethics Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India) : Profession, Professionalism, Professional Responsibility. Clash of Ethics, Conflicts of Interest. **Responsibilities in Engineering** - Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility.Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.

Module – V	RBT Level L1,L2,L3	03 Hours

Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship, Cybercrimes and enforcement agencies.

Course Outcomes: On completion of this course, students will be able to	
CO1	Have constitutional knowledge and legal literacy
CO2	Understand Engineering and Professional ethics and responsibilities of Engineers.
CO3	Understand the cyber-crimes and cyber laws for cyber safety measure.

Text Books:	
1.	Constitution of India and Professional Ethics, T.S. Anupama, Sunstar Publisher
Reference Books:	
1.	Durga Das Basu (DD Basu): "Introduction to the Constitution on India", (Students Edition.) Prentice –Hall EEE, 19th/20th Edn., (Latest Edition) or 2008.

2.	Shubham Singles, Charles E. Haries, and Et al : "Constitution of India and Professional Ethics" by Cengage Learning India Private Limited, Latest Edition – 2018.
3	M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice – Hall of India Pvt. Ltd. New Delhi, 2004.
4.	M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
5.	Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (40 marks each), the final IA marks to be awarded will be the average of three tests Assignment (10 marks)
SEE Assessment:
Question paper for the SEE consists one part. It is compulsory and consists of objective type 1 mark each for total of 50 marks covering the whole syllabus. Ten questions must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	2	2	1	1	1	1	2
CO2	1	2	2	1	1	2	1	1	1	1	1	2
CO3	2	1	2	1	1	1	1	1	1	1	1	2
CO4	2	2	1	1	1	1	1	1	1	1	1	2
CO5	2	2	1	1	1	2	1	1	1	1	1	2

High-3, Medium-2, Low-1

Course Title	UNIVERSAL HUMAN VALUES I	Semester	III
Course Code	MVJ20UHV310	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L : T : P :: 1 : 0 : 0)	Total	100
Credits	1	Exam. Duration	3 Hrs.

Course objective is to: This course will enable the students to

Perceive the need for developing a holistic perspective of life

Sensitise the scope of life – individual, family (inter-personal relationship), society and nature/existence, Strengthening self-reflection

Develop more confidence and commitment to understand, learn and act accordingly.

Module-1	L1,L2	3 Hrs

Welcome and Introductions: Getting to know each other (Self-exploration)

Aspirations and Concerns: Individual academic, career, Expectations of family, peers, society, nation, Fixing one's goals (Basic human aspirations Need for a holistic perspective Role of UHV)

Self-Management: Self-confidence, peer pressure, time management, anger, stress, Personality development, self-improvement (Harmony in the human Being)

Health: Health issues, healthy diet, healthy lifestyle, Hostel life (Harmony of the Self and Body Mental and physical health)

Relationships: Home sickness, gratitude, towards parents, teachers and, others Ragging and interaction, Competition and cooperation, Peer pressure (Harmony in relationship Feelings of trust, respect, gratitude, glory, love)

Society: Participation in society (Harmony in the society)

Natural Environment: Participation in nature (Harmony in nature/existence)

Video link:

https://youtube.com/playlist?list=PLYwzG2fd7hzc4HerTNkc3pS_IvcCfKznV

https://youtube.com/playlist?list=PLYwzG2fd7hzcZz1DkrAegkKF4TseekPFv

Presentation: https://fdp-si.aicte-india.org/AicteSipUHV_download.php

Module-2	L1,L2	3 Hrs

Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Self-exploration as the Process for Value Education, Happiness and Prosperity – Current Scenario.

Video link:

https://www.youtube.com/watch?v=85XCw8SU084

https://www.youtube.com/watch?v=E1STJoXCXUU&list=PLWDeKF97v9SP_Kt6jqzA3pZ3yA7g_OAQz

https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

Module-3	L1,L2	3 Hrs
Introduction to Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self, Harmony of the Self with the Body. **Video link:** https://www.youtube.com/watch?v=GpuZo495F24 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-4	**L1,L2**	**3 Hrs**
Introduction to Harmony in the Family and Society: Harmony in the Family – the Basic Unit of Human Interaction, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society. **Video link:** https://www.youtube.com/watch?v=F2KVW4WNnS8 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		
Module-5	**L1,L2**	**3 Hrs**
Introduction to Implications of the Holistic Understanding: Natural Acceptance of Human Values, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Holistic Technologies, Production Systems and Management Models-Typical Case Studies. **Video link:** https://www.youtube.com/watch?v=BikdYub6RY0 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw		

Course outcomes: On completion of the course, students would be able to

CO1	Develop a holistic perspective about life
CO2	Explore his/her role (value) in all aspects of living – as an individual, as a member of a family, as a part of the society as an unit in nature
CO3	Become more responsible in life, and in handling problems with sustainable solutions
CO4	Have better critical ability
CO5	Become sensitive to their commitment

Scheme of Evaluation

Details		Marks
Assessment by Faculty mentor (Class Room Evaluation)	CIE(50)	10
Self-Assessment + Assessment by peers		20
Activities / Experimentations related to courses/Assignment		10
Mini Projects / Case Studies		10

Semester End Examination	SEE (50)	50
Total		100

Text Books:	
1.	AICTE SIP UHV-I Teaching Material, https://fdp-si.aicte india.org/ AicteSipUHV _download.php
2.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
3.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference Books:	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4.	The Story of Stuff (Book).
5.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1				2	2	3	2	1	2	1
CO2		1				2	2	3	2	1	2	1
CO3		1				2	2	3	2	1	2	1
CO4		1				2	2	3	2	1	2	1
CO5		1				2	2	3	2	1	2	1

High-3, Medium-2, Low-1

Course Title	Additional Mathematics-I (Common to all branches)	Semester	III
Course Code	MVJ20MDSDIP301	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	-	Exam. Duration	3hrs

Course objective is to:
This course viz., aims to prepare the students:
To familiarize the important and basic concepts of Differential calculus and Differential Equation, ordinary/partial differential equations and Vector calculus and analyse the engineering problems.

Module-1	L1,L2	8Hrs.

Differential calculus: Recapitulations of successive differentiations -nth derivative -Leibnitz theorem and Problems, Mean value theorem -Rolle's theorem, Lagrange's Mean value theorem , Cauchy's theorem and Taylor's theorem for function of one variables.
Video Link:
https://users.math.msu.edu/users/gnagy/teaching/ode.pdf

Module-2	L1,L2	8 Hrs.

Integral Calculus:
Review of elementary Integral calculus, Reduction formula
$\int_0^{\frac{\pi}{2}} sin^m x\, dx$, $\int_0^{\frac{\pi}{2}} cos^m x\, dx$, $\int_0^{\frac{\pi}{2}} sin^m cos^n x\, dx$ and problems.
Evaluation of double and triple integrals and Simples Problems.
Video Link:
https://www.youtube.com/watch?v=rCWOdfQ3cwQ
https://nptel.ac.in/courses/111/105/111105122/

Module-3	L1,L2	8Hrs.

Vector Calculus: Derivative of vector valued functions, Velocity, Acceleration and related problems, Scalar and Vector point functions, Gradient, Divergence, Curl, Solenoidal and Irrotational vector fields. Vector identities - div (φA), curl (φA), curl (grad φ), div (curl A).

Video Link:
https://www.whitman.edu/mathematics/calculus_online/chapter16.html

https://www.math.ust.hk/~machas/vector-calculus-for-engineers.pdf

Module-4	L1,L2,L3	8 Hrs.
Probability: Introduction-Conditional Probability, Multiplication theorem ,Independent events ,Baye's theorem and Problems. Video Link: https://www.khanacademy.org/math/statistics-probability/probability-library https://nptel.ac.in/courses/111/105/111105041/		
Module-5	L1,L2,L3	8 Hrs.
Differential equation: Homogenous differential equation, Linear differential equation, Bernoulli's differential equation and Exact differential equation. Video Link: https://www.mathsisfun.com/calculus/differential-equations.html		

Course outcomes:	
CO1	Apply the knowledge of Differential calculus in the modeling of various physical and engineering phenomena
CO2	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.
CO3	Study on Vector calculus to understand the various solution to Application to Engineering problems.
CO4	Understand the basic Concepts of Probability
CO5	Solve first order linear differential equation analytically using standard methods.

Text Books:	
1.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.

Reference Books:	
1.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition,2014.
2.	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests Quizzes/mini tests (10 marks) Assignments (10 marks)

SEE Assessment:
Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	3	0	0	0	0	0	0	1	1
CO2	2	3	0	3	0	0	0	0	0	0	1	1
CO3	2	2	0	2	0	0	0	0	0	0	1	0
CO4	3	2	0	3	0	0	0	0	0	0	0	1
CO5	3	3	0	2	0	0	0	0	0	0	0	0

High-3, Medium-2, Low-1

IV SEMESTER B.E. (6 Theory, 2 Labs, 1 Kannada/CPH, 1 MATDIP, 1 AICTE Activity)

S No	Course		Course Title	Teaching Department	Teaching hours/week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total marks	
	Type	Code			L	T	P					
1	BSC	MVJ20MIS41/CD41	Numerical Methods, Operations Research & Statistics	Mathematics	2	2	0	3	50	50	100	3
2	PCC	MVJ20CD42	Design & Analysis of Algorithm	DS Dept	3	2	0	3	50	50	100	4
3	PCC	MVJ20CD43	Advanced Java & J2EE	DS Dept	3	1	0	3	50	50	100	3
4	PCC	MVJ20CD44	Data Mining & Data Warehouse	DS Dept	4	0	0	3	50	50	100	3
5	PCC	MVJ20CD45	Information Retrieval & Visualization	DS Dept	4	0	0	3	50	50	100	3
6	PCC	MVJ20CD46	Virtual Reality	DS Dept	4	0	0	3	50	50	100	3
7	PCC	MVJ20ISL47/CDL47	Design & Analysis of Algorithm Lab	DS Dept	0	1	2	3	50	50	100	2
8	PCC	MVJ20CDL48	Advanced Java Programming Lab	DS Dept	0	1	2	3	50	50	100	2
9	HSMC	MVJ20KAN49	Kannada	Humanities	1	0	0	3	50	50	100	1
		MVJ20CPH49	CPH					3	50	50		
10	NCMC	MVJ20MATDIP41	Additional Mathematics-2	Mathematics				3	50	50	100	-
11	NCMC	AICTE Activity for 80-90 hours (20 points)		-	-	-	-	-	-	-	-	-
				Total	21	7	4	30	500	500	1000	**24**

Note: BSC: Basic Science, PCC: Professional Core Course, HSMC: Humanity and Social Science
MVJ20MXXDIP401- Mandatory non-credit course, NCMC: Non-credit mandatory course

Course Title	Numerical Methods, Operations Research & Statistics	Semester	IV
Course Code	MVJ20MCD41	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 2 : 2 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

The purpose of this course is to make students well conversant with numerical methods to solve ordinary differential equations, sampling theory and Operational research emerging in science and engineering.

Module-1	L1,L2, L3	12 Hours

Numerical Methods-1

Numerical solution of Ordinary Differential Equations of first order and first degree: Modified Euler's method, Taylor's series method, Runge-Kutta method of fourth order, Predictor and Corrector method: Milne's Method and Adams-Bashforth Method.

Application: Solving Ordinary Differential Equations.

Video Links:
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/

Module-2	L1,L2, L3	12 Hours

Numerical Methods-2:

Numerical solution of Ordinary Differential Equations of second order: Runge-Kutta method of fourth order, Predictor and Corrector method: Milne's Method and Adams Bashforth Method.

Calculus of Variations: Variation of function and Functional, variational problems. Euler's equation, Geodesics.

Application: Hanging chain problem.

Video Links:
1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/

Module-3	L1,L2, L3	12 Hours
Operations Research-1 Introduction to Linear Programming Problem (LPP): Prototype example, Assumptions of LPP, Formulation of LPP and Graphical method various examples. The simplex method, Big M method, Two phase method and dual simplex method. Application: Graphical solution procedure. Video Links: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-4	**L1,L2, L3**	**12 Hours**
Operations Research-2 The transportation problem: Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Game Theory: The formulation of two persons, zero sum games; saddle point, maxmin and minmax principle, Solving simple games- a prototype example, Games with mixed strategies. Application: Transportation problem. Video Links: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		
Module-5	**L1,L2, L3**	**12 Hours**
Statistical Methods Correlation and Regression: Correlation, Regression coefficients, line of regression problems. Curve fitting: Fitting of the curves of the form $y = ax + b$, $y = ax^2 + bx + c$, $y = ae^{bx}$ by the method of least squares. Application: Finding the best fit between two variables. Video Links: 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central.com/subject/math(MOOCs) 3. http://academicearth.org/		

Course outcomes:	
CO1	Solve first and second order ordinary differential equation arising in flow problems using single step numerical methods.
CO2	Determine the extremals of functional and solve the simple problems of the Calculus of variations.
CO3	Solve the mathematical formulation of linear programming problem.
CO4	Solve the applications of transport problems and theory of games.
CO5	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.

Reference Books:	
4.	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
5.	S. D. Sharma, "Operations Research", Kedar Nath and Ram Nath Publishers, Seventh Revised Edition 2014.
6.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014.
7.	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
8.	Bali N. P. & Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 8th Edition
9.	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10th edition, 2014.

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	0	3	0	0	0	0	0	0	0	1
CO2	3	2	0	3	0	0	0	0	0	0	0	0
CO3	3	3	0	2	0	0	0	0	0	0	0	0
CO4	2	3	0	3	0	0	0	0	0	0	0	1
CO5	3	3	0	3	0	0	0	0	0	0	0	1

High-3, Medium-2, Low-1

Course Title	Design & Analysis of Algorithm	Semester	IV
Course Code	MVJ20CD42	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 2 : 0)	Total	100
Credits	4	Exam. Duration	3 Hours

Course objective is to:

- Explain various computational problem-solving techniques.
- Apply appropriate method to solve a given problem.
- Describe various methods of algorithm analysis

Module-1	L1,L2, L3	12 Hours

Introduction to Algorithms: The role of algorithms in computing, Growth of functions, Asymptotic notations, Designing and Analysing algorithms-an Introduction using insertion sort. Review on the Math needed for algorithm design and analysis.

Laboratory Sessions/ Experimental learning:

- Implement insertion sort and test its efficiency.

Applications: Develop a realistic model for the input to the program. Analyse the unknown quantities, assuming the modelled input. Calculate the total running time by multiplying the time by the frequency for each operation, then adding all the products.

Video link / Additional online information :
https://www.tutorialspoint.com/data_structures_algorithms/asymptotic_analysis.htm

Module-2	L1,L2, L3	12 Hours

Divide and Conquer: Solving recurrences – The Substitution method, Recurrence Tree method and Master's method, Multiplying large integers, Binary Search, Sorting [Merge Sort and Quick Sort], Selection in linear time [Expected and Worst-case], Strassen's algorithm for Matrix Multiplication, The maximum sub-array problem.

Laboratory Sessions/ Experimental learning:

- Implement maximum sub array algorithm and test their correctness and efficiency

Applications: Closest Pair of Points, Strassen's Multiplication, Karatsuba Algorithm, Cooley-Tukey Algorithm

Video link / Additional online information :
https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_
divide_conquer_htm

Module-3	L1,L2, L3	12 Hours

Greedy Algorithms: Characteristics of Greedy algorithms, The problem of making change, Greedy algorithms for Scheduling, Minimum Spanning Trees – Kruskal's Algorithm and Prim's Algorithm, Greedy Algorithms for finding the shortest paths in a Graph, The Knapsack problem Amortized Analysis: The accounting method, The potential method.

Laboratory Sessions/ Experimental learning:

- Implement Knapsack Algorithm using Greedy method.

Applications: Dijkstra's Algorithm, Google Map

Video link / Additional online information :
https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_
greedy_method_htm

Module-4	L1,L2, L3	12 Hours

Dynamic Programming: Calculating the binomial co-efficient, the problem of making change, The Knapsack problem, Chained matrix multiplication, Finding the shortest paths in a Graph, Reformulating Dynamic programming algorithms using recursion and memory functions.

Laboratory Sessions/ Experimental learning:

- Implement single source shortest path algorithm.

Applications: Logistic/Transportation Problems

Video link / Additional online information :
https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_
dynamic_programming_htm

Module-5	L1,L2, L3	12 Hours
Backtracking: N-Queen's Problem -Graph colouring. Branch and Bound: Assignment Problem - Traveling Salesman Problem. Computability classes – P, NP, NP-complete and NP-hard. Laboratory Sessions/ Experimental learning: • Implement graph colouring Problem Applications: Electrical Engineering, Robotics, Artificial Intelligence, Materials Engineering, Solving Puzzles Video link / Additional online information : https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_ p_np_class_htm		

Course outcomes:	
CO1	Analyze the correctness of algorithms using induction and loop invariants.
CO2	Construct algorithms using design paradigms like divide and conquer, greedy and dynamic programming for a given problem.
CO3	Analyze how the performance of an algorithm is affected based on the choice of data structures the algorithm uses.
CO4	Construct graph-based algorithms to solve engineering problems.
CO5	Outline P and NP problems with the help of backtracking and branch and bound techniques

Reference Books:	
1.	Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009.Pearson.
2.	Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press
3.	Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein – Introduction to Algorithms, Third edition, PHI, 2010.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	0	0	0	0	2	0	0
CO2	3	3	3	2	3	0	0	0	0	2	0	0
CO3	3	3	2	2	3	0	0	0	0	2	0	0
CO4	3	3	2	2	3	0	0	0	0	2	0	0
CO5	3	3	3	2	3	0	0	0	0	2	0	0

High-3, Medium-2, Low-1

Course Title	Advanced JAVA & J2EE	Semester	IV
Course Code	MVJ20CD43	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 3 : 1 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to: *: This course will enable students to*

- Construct client-server applications using Java socket API
- Identify the need for advanced Java concepts like Enumerations and Collections
- Make use of JDBC to access database through Java Programs
- Adapt servlets to build server side programs
- Demonstrate the use of JavaBeans to develop component-based Java software

Module-1	L1,L2,L3	12 Hours

Syllabus Content:

Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations

Application:

- choices on a menu, rounding modes, command line flags, etc.
- Autoboxing & Auto unboxing:
- Annotations

Video Link: https://www.youtube.com/watch?v=vJ-Zn4fo0MQ&t=608s

Module-2	L1,L2,L3	12 Hours

Syllabus Content:

The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With

Maps, Comparators, The Collection Algorithms, Why Generic Collections, The legacy Classes and Interfaces,
Parting Thoughts on Collections.

Application: Writing an application

Video Link: https://www.youtube.com/watch?v=Ma7u6KEKzPE

Module-3	L1,L2,L3	12 Hours

Syllabus Content:

String Handling :The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and to String( ) Character Extraction, char At( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder

Application: Datatype

Video Link: https://www.youtube.com/watch?v=N63JCXwdd14

Module-4	L1,L2,L3	12 Hours

Syllabus Content:

Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects

Application: java-based web application.

Video Link: https://www.youtube.com/watch?v=ewiOaDitBBw

Module-5	L1,L2,L3	12 Hours

Syllabus Content:

JDBC Overview – JDBC implementation – Connection class – Statements - Catching Database Results, handling database Queries. Networking– Inet Address class – URL class-TCP sockets - UDP sockets, Java Beans –RMI.

Application: Connecting, storing, retrieving data between program and any database. Video Link: https://www.youtube.com/watch?v=Cq4lwVE2Fzk
Practical Experiments: 1. Program to demonstrate working of Inet Address class and the methods of the InetAddress class for Java Networking 2. Program to demonstrate how to apply event handling mechanism to JCheckBox Swing Components : 3. Program to demonstrate JDBC 4. Program to demonstrate RMI 5. Program to demonstrate SERVLETS 6. Program to demonstrate JSP Program to demonstrate JAVA BEANS

Course outcomes:	
CO1	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
CO2	Build client-server applications and TCP/IP socket programs
CO3	Illustrate database access and details for managing information using the JDBC API
CO4	Describe how servlets fit into Java-based web application architecture
CO5	Develop reusable software components using Java Beans

Text/Reference Books:	
1.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hil 2007.
2.	Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.
3.	Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
4.	Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.
5.	Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			3	2	2	2		2				1
CO2		3	3	2	2	2		2				2
CO3		3	3	2	2	2		2				3
CO4		3	3	2	2	2		2				2
CO5		3	3	2	2	2		2				3

High-3, Medium-2, Low-1

Course Title	Data Mining & Data Warehouse	Semester	IV
Course Code	MVJ20CD44	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Gather and analyze large sets of data to gain useful business understanding
- Understand the data mining functionalities, technologies and steps in pre-processing the data
- Learn data mining algorithms, methods and tools

Module-1	L1,L2,L3	12 Hours

Raw data to valuable information-Lifecycle of Data - What is data warehousing - The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Basic elements of data warehousing - Principles of dimensional modelling: Star schema, Snowflake schema and Galaxy schema.

Application:
Identify the potential risk of default and manage and control collections
Performance analysis of each product, service, interchange, and exchange rates
Store and analyze information about faculty and students
Maintain student portals to facilitate student activities

Video Link:
https://www.youtube.com/watch?v=8lHpioyvSng

Module-2	L1,L2,L3	12 Hours

Introduction to Data Mining Systems, Knowledge Discovery Process -Data Objects and attribute types, Statistical description of data, Data Preprocessing- Data Cleaning, Data Integration and Transformation, Data Reduction.

Application:

Financial Analysis
Telecommunication Industry.
Intrusion Detection
Retail Industry
Higher Education
Video Link:
https://www.youtube.com/watch?v=QRZlYzxEFDg

Module-3	L1,L2,L3	12 Hours

Market Basket Analysis, Frequent Item sets, Closed Itemsets, Association Rules, Frequent Itemset Mining Methods- Apriori algorithm, Generating Association rules from Frequent Itemsets, A Pattern- Growth Approach for mining frequent Itemsets, Mining Frequent Itemsets using the Vertical Data Format.

Application:

- Market Basket Analysis
- Medical Diagnosis:
- Census Data
- Protein Sequence

Video Link:
https://www.youtube.com/watch?v=RiFrbyiYpRs

Module-4	L1,L2,L3	12 Hours

Classification and Prediction ,Basic Concepts, Decision Tree Induction, Bayesian Classification ,Rule Based Classification, Classification by Back propagation , Support Vector Machines, Lazy learners.

Application:

- Sentiment Analysis
- Email Spam Classification
- Document Classification
- Image Classification

Video Link:
https://www.youtube.com/watch?v=gkagE_fE2sk

Module-5	L1,L2,L3	12 Hours

Types of Data in Cluster Analysis , Data similarity and dissimilarity measures ,A Categorization of Major Clustering Methods -Partitioning Methods-K-means, K-medoids , Hierarchical Methods-Agglomerative vs Divisive, Distance measures, BIRCH, Clustering High-Dimensional Data- Outlier Analysis and Detection.

Application:

- Clustering analysis
- In the field of biology, it can be used to derive plant and animal taxonomies.

Identification of areas of similar land use in an earth observation database. Video Link: https://www.youtube.com/watch?v=2QTeuO0C-fY
Experimental Part: 1. Apriori Algorithm for market Basket Analysis 2. Bayesian Classification 3. Decision Tree Induction Algorithm 4. Frequent Pattern-Growth Algorithm

Course outcomes:	
CO1	Design data warehouse by applying principles of dimensional modelling and ETL concepts
CO2	Analyze various data pre-processing techniques for efficient data mining.
CO3	Apply association rule mining for finding hidden and interesting patterns in data.
CO4	Apply statistical procedure, machine learning and neural network based classification algorithms for data prediction
CO5	Apply clustering algorithms for the application and generalizations for real time problems

Text/Reference Books:	
1.	Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
2.	Paulraj Ponniah, Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, Wiley, 2010
3.	Alex Berson, Stephen J Smith, Data warehousing, Data mining, and OLAP, Tata McGraw Hill edition, 2007
4.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar,Introduction to Data Mining, Pearson Education, 2007
5.	G. K. Gupta ,Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	3	3	3		2					
CO2	3	3	3	3	3		2					
CO3	3	3	3	3	3	3						3
CO4	3	3	3	3	3	3		3				3
CO5	3	3	3	3	3	3						3

High-3, Medium-2, Low-1

Course Title	Information Retrieval & Visualization	Semester	IV
Course Code	MVJ20CD45	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Learn classical techniques of Information Retrieval and Evaluation
- Learn how to query and process
- Get an idea about how the different IR algorithms works.
- Understand Web Crawler and its functions.
- Realize the applications of Information Retrieval

Module-1	L1,L2	8 Hours

Basic Concepts – Retrial Process – Modelling – Classic Retrieval – Set Theoretic, Algebraic and Probabilistic Models.

Retrieval Techniques: Structured Retrieval Models – Retrieval Evaluation – Word Sense Disambiguation.

Application:

Using retrieval Techniques for searching information.

Video Link:
https://www.youtube.com/playlist?list=PLMyP8LIIL3ht_WV4EXjN-uD3EPEK3hIyu

Module-2	L2,L3	12 Hours

Languages – Key Word-based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis.

Document Pre-Processing – Clustering – Text Compression – Indexing and Searching – Inverted Files – Boolean Queries – Sequential Searching – Pattern Matching.

Application:

Analyzing query and document formatting for searching.

Video Link:
https://www.youtube.com/playlist?list=PLMyP8LIIL3ht_WV4EXjN-uD3EPEK3hIyu

Module-3	L2,L3	8 Hours
Overview of Retrieval Models –Boolean Retrieval – The Vector Space Model – Probabilistic Models – Information Retrieval as Classification – BM25 Ranking Algorithm – Complex Queries and Combining Evidence – Web Search – Machine Learning and Information Retrieval. Application: Select and ranks relevant documents Video Link: https://www.slideshare.net/mounialalmas/introduction-to-information-retrieval-models		
Module-4	L2,L3	8 Hours
Deciding what to search – Crawling the Web – Directory Crawling – Document Feeds – conversion problem – Storing the Documents – Detecting Duplicates – Remove noise. Application: Develop application data Video Link: https://www.youtube.com/playlist?list=PLMyP8LIIL3ht_WV4EXjN-uD3EPEK3hIyu		
Module-5	L2,L3	8 Hours
Searching the Web – Challenges – Characterizing the Web – Search Engines – Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs. Digital Libraries: Introduction – Architectural Issues – Document Models – Representations and Access – Prototypes and Standards. Case Study: Google, Yahoo and Bing Search engines Application: Interpret overall working of a search engine. Video Link: https://www.youtube.com/playlist?list=PLMyP8LIIL3ht_WV4EXjN-uD3EPEK3hIyu		
Practical Experiments/ Case Study:	L3	20
• Experiments related to Ontology and Semantic Web • Experiments related to Semantic Web Services • Cast Study: Google Page Ranking Algorithm		

Course outcomes:	
CO1	Rank the document using classical ranking methods
CO2	Querying documents by delivering keywords
CO3	Implement ranking algorithms for rank the documents
CO4	Know how the crawler works
CO5	Know how the web search, online IR systems and search engines works

Text/Reference Books:	
1.	Ricardo Baeza-Yate, Berthieri Ribeiro-Neto, Modern Information Retrieval, Pearson Education Asia, 2012.
2.	W.Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines – Information Retrieval in Practice, Pearson Education, 2015
3.	Grossman, David A. Frieder, Ophir, Information Retrieval Algorithms and Heuristics, 2nd Edition, Springer
4.	G.G. Chowdhury, Introduction to Modern Information Retrieval, Second Edition, Neal-Schuman Publishers, 2010.

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3											
CO2	3									2		
CO3	3	3								2		
CO4	3	3								2		2
CO5	3	3								2		2

High-3, Medium-2, Low-1

Course Title	Virtual Reality	Semester	IV
Course Code	MVJ20CD46	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4 (L : T : P :: 4 : 0 : 0)	Total	100
Credits	3	Exam. Duration	3 Hours

Course objective is to:

- Explain this technology, underlying principles, its potential and limits
- Knowledge about devices involved
- Learn about the criteria for defining useful applications.
- Illustrate process of creating virtual environments
- Applications of Virtual Reality

Module-1	L1,L2,L3	12 Hours

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. Input Devices: (Trackers, Navigation, and Gesture Interfaces): Three dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.

Application: Students can understand the basics of Virtual Reality.

Video Link: https://nptel.ac.in/courses/106/106/106106138/

Module-2	L1,L2,L3	12 Hours

Output Devices: Graphics displays, sound displays & haptic feedback.

Application: Students can get knowledge about the hardware involved in virtual reality.

Video Link: https://www.youtube.com/watch?v=Z1jQ62VDVSo

Module-3	L1,L2,L3	12 Hours

Modeling: Geometric modelling, kinematics modeling, physical modeling, behaviour modeling, model management

Application: Students will get the knowledge about various modeling techniques.

Video Link: https://www.youtube.com/watch?v=dF4QEfj61XQ

Module-4	L1,L2,L3	12 Hours

Human Factors: Methodology and terminology, user performance studies, VR health and safety issues. Application: Students will learn impact of virtual reality of real life. Video Link: https://www.youtube.com/watch?v=8DvwtzdNK5U		
Module-5	L1,L2,L3	12 Hours
Medical applications, military applications, robotics applications Application: Students can get the knowledge about the applications of virtual reality. Video Link: https://www.youtube.com/watch?v=fJES5HYMOg0		
Practical Experiments/Research paper Study: • Mobile Augmented Reality Based Experiments • Simulating Educational Physical Experiments in Augmented Reality • Web based Virtual Reality	L3	20 Hours

Course outcomes:	
CO1	Illustrate technology, underlying principles
CO2	Explain process of creating virtual environments
CO3	Explain its potential and limits and to learn about the criteria for defining useful applications.
CO4	Simulate physical experiments
CO5	Explain future research scope of virtual reality

Text/Reference Books:	
1.	Virtual Reality Technology, Second Edition, Gregory C. Burdea & Philippe Coiffet, John Wiley & Sons

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2						1	2	2
CO2	2	2	2	1						1		
CO3	2	1	1	1		1	1	1	1			1
CO4	3	2	1	1		1	1	1	1			2
CO5	1	1	1	2						1	1	

High-3, Medium-2, Low-1

Course Title	Design & Analysis of Algorithm Lab	Semester	IV
Course Code	MVJ20CDL47	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 1 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

- Understanding the basic algorithm techniques
- Solve different algorithmic technique problems
- Synthesize the efficiency of the algorithms in common engineering design situation

Sl No	Experiment Name	RBT Level	Hours
1	Implementation of Binary Search Trees	L3	4
2	Implementation of merge and quick sort algorithms and test their correctness and efficiency	L3	4
3	Implementation of Floyd-Warshall Algorithm and test their efficiency	L3	4
4	Implementation of 0/1 Knapsack problem using (a) Dynamic Programming method (b)Greedy method.	L3	4
5	(a) Implementation of all-Pairs Shortest Paths problem (b) Implementation of Travelling Sales Person problem	L3	4
6	Implementation and analysis of running time of eight-queen problem	L3	4
7	Implementation of insertion and topological sorting and test their efficiency.	L3	4
8	Program to find a subset of a given set S = {Sl, S2,.....,Sn} of *n* positive integers	L3	4
9	Program to find all Hamiltonian Cycles in a connected undirected Graph	L3	4
10	Mini Project /Case Presentation	L3	4

Course outcomes:

CO1	Analyze the complexities of various problems

CO2	Apply different algorithmic design paradigms and methods of analysis
CO3	Analyzing the different complexity for different algorithmic techniques
CO4	Implement various algorithms in a high-level language
CO5	Compare the performance of different algorithms for same problem

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CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	0	0	0	0	2	0	0
CO2	3	3	3	2	3	0	0	0	0	2	0	0
CO3	3	3	2	2	3	0	0	0	0	2	0	0
CO4	3	3	2	2	3	0	0	0	0	2	0	0
CO5	3	3	3	2	3	0	0	0	0	2	0	0

High-3, Medium-2, Low-1

Course Title	Advanced Java Programming Lab	Semester	IV
Course Code	MVJ20CDL48	CIE	50
Total No. of Contact Hours	30	SEE	50
No. of Contact Hours/week	3 (L : T : P :: 0 : 1 : 2)	Total	100
Credits	2	Exam. Duration	3 Hours

Course objective is to:

Develop error-free, well-documented Java programs.

Sl No	Experiment Name	RBT Level	Hours
1	WAP on Network Programming i.e. Client-Server Programming.	L3	4
2	WAP on Multithreading using runnable interface.	L3	4
3	WAP to Create a New Data Source for Ms. Access	L3	4
4	WAP to show connectivity with database using JDBC/ODBC driver.	L3	4
5	WAP to get Information about database using Database Meta Data	L3	4
6	WAP to get Information about particular table using Result Set Meta Data	L3	4
7	WAP to implement the concept of swings.	L3	4
8	WAP to develop an RMI application.	L3	4
9	WAP in Servlets to get and display value from an HTML page.	L3	4
10	WAP in JSP to get and display value from an HTML page.	L3	4

Course outcomes:

CO1	Develop Java network programs.
CO2	Develop search engine, and web framework programs
CO3	Learn how to write advanced-level Object-Oriented programs using Java.
CO4	Develop appropriate data model and database scheme
CO5	Test and Validate Programs

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	0	0	0	0	0	0	0	0	0	0	0
CO2	3	2	1	0	0	0	0	0	0	0	0	0
CO3	0	0	2	3	0	0	0	0	0	0	0	0
CO4	0	0	2	3	0	0	0	0	0	0	0	0
CO5	0	0	3	0	0	0	0	0	0	0	0	0

\High-3, Medium-2, Low-1

Course Title	Balike Kannada	Semester	IV
Course Code	MVJ20BKAN49	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L : T : P :: 1 : 0 : 0)	Total	100
Credits	1	Exam. Duration	3Hrs

Course objective : This course will enable students to understand Kannada and communicate in Kannada language Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada) Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronounciation. Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication). Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana) Activities in Kannada
CHAPTER-1
Vyavharika Kannada –Parichaya (Introduction to Vyavharika kannada)
CHAPTER-2
Kannada Aksharamaale haagu uchcharane(Kannada Alphabets and Pronounciation
CHAPTER-3
Sambhashanegaagi Kannada Padagalu (Kannada Vocubulary for Communication).
CHAPTER-4
Kannada Grammer in Conversations(Sambhasaneyalli Kannada Vyakarana)

CHAPTER-5

Activities in Kannada

cheme of Evaluation:

Details		Marks
Average of three Internal Assessment (IA) Tests of 30 Marks each i.e. Σ (Marks Obtained in each test) / 3	CIE(50)	30
ASSIGNMENT		20
Semester End Examination	SEE (50)	50
Total		100

Course Title	SAMSKRUTHIKA KANNADA	Semester	IV
Course Code	MVJ20SKAN49	CIE	50
Total No. of Contact Hours	15	SEE	50
No. of Contact Hours/week	1 (L: T: P :: 1 : 0 : 0)	Total	100
Credits	1	Exam. Duration	3Hrs

Course objective :This course will enable students to understand Kannada and communicate in Kannada language Samskruthika Kannada –Parichaya (Introduction to Adalitha kannada) Kannada Kavyagala parichaya (Kannada D Ra Bendre, Siddalingaiha) Adalithdalli Kannada Padagalu (Kannada Kagunitha Balake, Patra Lekhana, Prabhandha) Kannada Computer Gnyana (Kannada Shabdha Sangraha, Computer Paribashika padagalu) Activities in Kannada.
ಅಧ್ಯಾಯ –1
ಕನ್ನಡ ಭಾಷೆ–ಸಂಕ್ಷಿಪ್ತ ವಿವರಣೆ.
ಅಧ್ಯಾಯ –2
ಭಾಷಾ ಪ್ರಯೋಗಲ್ಲಾಗುವ ಲೋಪದೋಷಗಳು ಮತ್ತು ಅವುಗಳ ನಿವಾರಣೆ.
ಅಧ್ಯಾಯ –3
ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ.
ಅಧ್ಯಾಯ –4
ಪತ್ರ ವ್ಯವಹಾರ.
ಅಧ್ಯಾಯ –5
ಆಡಳಿತ ಪತ್ರಗಳು.
ಅಧ್ಯಾಯ –6
ಸರ್ಕಾರದ ಆದೇಶ ಪತ್ರಗಳು
ಅಧ್ಯಾಯ –7

ಸಂಕೀಪ್ತ ಪ್ರಬಂಧ ರಚನೆ, ಪ್ರಬಂಧ ಮತ್ತು ಭಾಷಾಂತರ
ಅಧ್ಯಾಯ –8
ಕನ್ನಡ ಶಬ್ದಸಂಗ್ರಹ
ಅಧ್ಯಾಯ –9
ಕಂಪ್ಯೂಟರ್ ಹಾಗೂ ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ
ಅಧ್ಯಾಯ –10
ಪಾರಿಭಾಷಿಕ ಆಡಳಿತ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ/ಕಂಪ್ಯೂಟರ್ ಪಾರಿಭಾಷಿಕ ಪದಗಳು.

Scheme of Evaluation:

Details		Marks
Average of three Internal Assessment (IA) Tests of 30 Marks each i.e. Σ (Marks Obtained in each test) / 3	CIE(50)	30
ASSIGNMENT		20
Semester End Examination	SEE (50)	50
Total		100

Course Title	Additional Mathematics-II (Common to all branches)	Semester	IV
Course Code	MVJ20MDSDIP401	CIE	50
Total No. of Contact Hours	40	SEE	50
No. of Contact Hours/week	4	Total	100
Credits	-	Exam. Duration	3 Hours

Course objective is to: This course viz., aims to prepare the students:
To familiarize the important and basic concepts of Differential calculus and Differential
Equation, ordinary/partial differential equations and Vector calculus and analysethe engineeringproblems.

Module-1	L1,L2	8Hrs.

Linear Algebra:
Introduction,Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method and problems. Eigen values and Eigen vectors of square matrix and Problems.
Video Link:
https://www.math.ust.hk/~machas/matrix-algebra-for-engineers.pdfhttps://nptel.ac.in/content/storage2/courses/122104018/node18.html

Module-2	L1,L2	8 Hrs.

Differential calculus:
Tangent and normal, sub tangent and subnormal both Cartesian and polar forms. Increasing and decreasing functions, Maxima and Minima for a function of one variable. Point of inflections and Problems
Beta and Gamma functions:
Beta functions, Properties of Beta function and Gamma function ,Relation Between beta and Gamma function-simple problems.
Video Link:
https://www.youtube.com/watch?v=6RwOoPN2zqE
https://www.youtube.com/watch?v=s6F5yjY6jWk&list=PLMLsjhQWWlUqBoTCQDtYlloI-o-9hxp11
http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx

Module-3	L1,L2	8Hrs.
Analytical solid geometry : Introduction –Directional cosine and Directional ratio of a line, Equation of line in space- different forms, Angle between two line, shortest distance between two line, plane and equation of plane in different forms and problems. Video Link: https://www.toppr.com/guides/maths/three-dimensional-geometry/ https://www.toppr.com/guides/maths/three-dimensional-geometry/distance-between-skew-lines/		
Module-4	**L1,L2,L3**	**8 Hrs.**
Probability: Random variable, Discrete probability distribution, Mean and variance of Random Variable, Theoretical distribution-Binomial distribution, Mean and variance Binomial distribution -Problems. Poisson distribution as a limiting case of Binomial distribution, Mean and variance of Poisson distribution. Normal Distribution-Basic properties of Normal distribution –standard form of normal distribution and Problems. Video Link: https://nptel.ac.in/courses/111/105/111105041/ https://www.mathsisfun.com/data/probability.html		
Module-5	**L1,L2,L3**	**8 Hrs.**
Partial differential equation: Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Video Link: http://tutorial.math.lamar.edu/Classes/DE/IntroPDE.aspx https://www.studyyaar.com/index.php/module-video/watch/233-cauchys-legendres-de-a-method-of- variation-of-parameters		
Course outcomes:		
CO1	Apply the knowledge of Matrices to solve the system of linear equations and to understand the concepts of Eigen value and Eigen vectors for engineering problems.	
CO2	Demonstrate various physical models ,find Maxima and Minima for a function of one variable., Point of inflections and Problems .Understand Beta and Gamma function	
CO3	Understand the 3-Dimentional geometry basic, Equation of line in space- different forms, Angle between two line and studying the shortest distance .	
CO4	Concepts OF Probability related to engineering applications.	
CO5	Construct a variety of partial differential equations and solution by exact methods.	

Text Books:	
1	B.S. Grewal, "Higher Engineering Mathematics" Khanna Publishers, 43rd Edition, 2013.
2	Ramana B. V., "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006.
Reference Books:	
1	Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley-India publishers, 10thedition,2014.
2	G. B. Gururajachar: Calculus and Linear Algebra, Academic Excellent Series Publication, 2018-19

CIE Assessment:
CIE is based on quizzes, tests, assignments/seminars and any other form of evaluation. Generally, there will be: Three Internal Assessment (IA) tests during the semester (30 marks each), the final IA marks to be awarded will be the average of three tests - Quizzes/mini tests (10 marks) - Assignments (10 marks)
SEE Assessment:
iii. Question paper for the SEE consists two parts i.e. Part A and Part B. Part A is compulsory and consists of objective type or short answer type questions of 1 or 2 marks each for total of 20 marks covering the whole syllabus. iv. Part B also covers the entire syllabus consisting of five questions having choices and may contain sub-divisions, each carrying 16 marks. Students have to answer five full questions. v. One question must be set from each unit. The duration of examination is 3 hours.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	0	2	0	0	0	0	0	0	1	1
CO2	3	3	0	2	0	0	0	0	0	0	1	1
CO3	3	3	0	3	0	0	0	0	0	0	0	1
CO4	2	2	0	3	0	0	0	0	0	0	1	1
CO5	2	2	0	2	0	0	0	0	0	0	0	1

High-3, Medium-2, Low-1